The FOUNDRY

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Castings Certify Materials in Brick Homes

FOR the past two years, houses built of clay products in the Cleveland district have been certified by the Cleveland Clay league with respect to quality of materials and workmanship. Where all specifications are met, a skeleton cast bronze brick containing the words "Cleveland-Made Certified Walls" is set in the exterior wall of the home or building. Usually the brick is placed in a conspicuous place near the entrance or on the chimney.

Courtesy Cleveland Clay League

A Cast Bronze Brick Is Placed in the Wall to Certify Workmanship and Materials

In some instances it is used as the corner stone of the building. The cast bronze brick is not placed in the wall until after the materials and workmanship have been inspected thoroughly by an officer of the league and found satisfactory. When the bronze brick is placed in the wall, a certificate, signed by the architect, contractor and the clay league, is presented to the owner as a guarantee of the work. The first home in a new subdivision to be approved by the league is certified with a special ceremony at which prominent people are invited. Recently the Common Brick Manufacturers Association of America, the national organization of brick manufacturers, has adopted the idea originated by the Cleveland group. A brick, similar to the one shown in the illustration, but containing the words "C. B. M. A. of A. Certified Masonry Walls" will be used.

Find Where Castings Can Be Sold.

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Convention to Progress

Elected President

FRED ERB, president of the Erb-Joyce Foundry Co., Detroit, has been elected president of the American Foundrymen's association. Mr. Erb has been connected with the foundry industry continuously since he was graduated in 1908 from the University of Michigan, Ann Arbor, Mich., with the degree of B. S. in mechanical engineering. He started his career as a cupola hand with the Detroit Foundry Co., Detroit, where he advanced to the position of foundry superintendent and later plant manager. In 1913, he left that organization to assist in the formation of the Lakeside Foundry, Detroit. Shortly after he accepted a position with the Elmira Foundry Co., Elmira, N. Y. Later he returned to Detroit as superintendent of the foundry division of the Packard Motor Car Co. and in 1920 he was appointed manager of the foundry division of that company. He resigned in 1925 to become president of the Erb-Joyce Foundry Co., Detroit. Mr. Erb has been active in the affairs of the Detroit Foundrymen's association and is one of its past presidents. He also has held the chairmanship of many important committees of the American Foundrymen's association, has been a member of the board of directors and for the past year has served as vice president of the Association.

THE Chicago convention of the American Foundrymen's association, an experiment in several respects, passed into history a success in every way. Approximately 3500 people directly interested in the problems of the foundry industry registered during the four day session held at the Stevens hotel, April 8 to 11. The exhibition of equipment, held in the large hall on the basement floor of the hotel, created considerable interest with approximately 150 exhibits showing the latest developments in equipment and supplies for the industry.

Visitors at the convention gave more attention to the various technical sessions than usually is the case. Practically all of the meetings covering the four branches of the industry were well attended, and many of those present took an active part in the discussion. The gray iron foundry shop operation course, which was introduced and immediately became a success at the Philadelphia meeting last year, was provided at Chicago. Over 250 convention visitors took part in each of the meetings. The idea of a shop course was extended to the steel industry, and while attendance at the steel foundry shop operation course was not as large as at the gray iron meetings, interest was exceptionally high.

Centralization of all activities in the Stevens hotel, an organization ideally fitted to handle a convention and exhibition of the restricted type, added materially to the success of the gathering. Undoubtedly, the foundrymen of America became better acquainted through the contacts made at Chicago. The fact that the technical sessions were held on the third floor of the hotel, relatively near the exhibit, also aided the attendance at the meetings.

Many foundrymen availed themselves of the opportunity for visiting various foundries in Chicago and the surrounding district. A number of plants held open house all week and provided guides to conduct the visitors through the plant. An information booth in the Stevens gave directions regarding the quickest way to get to the various plants and provided introduction cards for the visitors.

A special program was offered for the ladies at the convention, with a hostess in charge of all activities. Several inspection trips were held including a visit to the Field Museum, and a

Points Way
Industry

Made Vice President

NATHANIEL K. B. PATCH elected vice president of the American Foundrymen's association, is secretary of the Lumen Bearing Co., Buffalo, N. Y. He was born in Franklin township, Houghton county, Mich., Feb. 15, 1879. He received his early education in the public schools of Hancock and Hubbell Mich., and Buffalo, N. Y. In 1897 he entered Massachusetts Institute of Technology but was forced to abandon his studies in 1900 because of poor eye sight. From 1900 to 1901 he was employed by the Buffalo Smelting Works in various capacities. On Jan. 1, 1901, Mr. Patch joined the sales force of the Lumen Bearing Co., Buffalo, and continued in that capacity until July 1904 when he was made manager of the Canadian branch at Toronto, Ont. In April 1912 he returned to the Buffalo plant to act as secretary of the company and plant engineer and in 1913 he was advanced to general superintendent of the Buffalo plant. In 1919, he was appointed secretary of the company and in 1924 he retired from the position of works manager to devote his time exclusively to his duties as secretary. Mr. Patch has been active in the work of the Foundrymen's association for many years, having served as chairman of many committees including the correlation committee, and as a director of the association.

special luncheon was held on Tuesday, April 9.

The 1930 convention and exhibition of the association will be held in Cleveland during the week of May 12, according to an announcement made by executive-secretary, C. E. Hoyt, at the annual business meeting Monday afternoon. Approximately 150,000 square feet of floor space will be available in Cleveland's Public Hall for the exhibition of foundry equipment and the technical sessions will be held in rooms provided by recent additions to the building.

The business meeting, the first convention session, was called to order by President Johnston at 2 o'clock Monday. After a brief talk by the president, the report of the executive secretary was presented by Mr. Hoyt. Among other things, this report recommended a reclassification of members and a change in the dues for certain classes. This recommendation was referred to the board of directors by vote of the members present. Mr. Hoyt reported a total membership of 2365 on Dec. 31, 1928, a slight gain over the preceding year.

Short reports were made by N. K. B. Patch, Lumen Bearing Co., Buffalo, chairman of the new correlation committee of divisional activities; Scott MacKay, chairman of the malleable iron division; J. Fletcher Harper, Allis-Chalmers Mfg. Co., Milwaukee, chairman of the steel division; Fred Erb, Erb-Joyce Foundry Co., Vassar, Mich., chairman of the molding sand research committee; H. Cole Estep, Penton Publishing Co., Cleveland, chairman committee on international relations; C. J. Freund, Falk Corp., Milwaukee, chairman of committee on training apprentices; and A. E. Hageboeck, Frank Foundries Corp., Moline, Ill., chairman of committee on foundry costs.

On behalf of the Foundrymen's International committee, president Dr. S. G. Werner, Verein Deutscher Eisengiessereien, Dusseldorf, Germany, extended greetings and an invitation to attend the International Foundrymen's congress in London in June. Dr. Werner, paid tribute to the American Foundrymen's association, which he considers a model for associations of the world.

J. H. Whiting, chairman of the board, Whiting Corp., Harvey, Ill., and a charter member of the association, was elected to honorary membership. Volmer M. Blair, Brown & Sharpe Mfg. Co., Providence, was announced as the winner of the S. Obermayer prize contest for the 1929 meeting.

The report of the nominating committee was read and adopted unanimously. Officers for 1930, as previously announced in THE FOUNDRY, are as follows: President, Fred Erb, Erb-Joyce Foundry Co., Vassar, Mich.; vice president, N. K. B. Patch, Lumen Bearing Co., Buffalo; directors, H. S. Falk, Falk Corp., Milwaukee; S. T. Johnston, S. Obermayer Co., and National Engineering Co., Chicago; Frank J. Lanahan, Fort Pitt Casting Co., Pittsburgh; Arnold Lenz, Chevrolet Motor Co., Saginaw, Mich.; D. H. Wray, Henry Wray & Son, Rochester, N. Y.

Twenty professors and instructors of foundry practice representing many of the leading engineering colleges met at a dinner Monday night under arrangements made by R. E. Kennedy, technical secretary of the American Foundrymen's association. This was the third gathering of this nature designed for discussion of practical educational problems. Prof. J. D. Hoffman, Purdue university, Lafayette, Ind., who presided, outlined the intentions and opportunities for service available to men instructing students in foundry fundamentals. Dan M. Avey, editor, THE FOUNDRY, spoke on the need for attracting active intelligent young men into the foundry field. He presented thumbnail biographies of outstanding men in the foundry world, who have pushed to the top without the assistance of special schooling and also of college men, who have drifted, rather than driven through into the first ranks of successful foundry operators and executives. He urged greater effort in attracting students, greater attention to collegiate education directed toward the foundry field and broader opportunities made available for such men.

John W. Bolton, Lunkenheimer Co., Cincinnati, in a brief address, touched upon the desirability of a better understanding of the engineering properties of castings in general. In the case of gray iron, popular and even well informed engineering opinion underestimates the material and regards it as uniform in possessing physical qualities far below those which the forty or more alloys of cast iron can develop. The responsibility for cultivating a better understanding rests in a large measure upon the men charged with educating engineers and particularly those in the foundry departments of the universities.

Prof. Scott Mackay, University of Wisconsin, Madison, Wis., mentioned the work being done by the institution he represents and the effort to interest manufacturers in the class of men educated in fundamentals of foundry practice.

Approximately 300 manufacturers of equipment and supplies attended the annual exhibitors dinner on Monday evening in the ball room of the Stevens hotel. The event was held under the auspices of the American Foundrymen's association and the Foundry Equipment Manufacturers association. Following the banquet, S. T. Johnston, president of the American Foundrymen's association introduced H. W. Standart, president of the Foundry Equipment Manufacturers association, who spoke briefly on "The Function of Equipment in Foundry Practice." Dr. Siegfried G. Werner, president of the Foundrymen's International committee and president of the German Iron Founders association, expressed appreciation for the splendid reception accorded him during his visit to America, and extended an invitation to all to attend the International congress in London. H. Cole Estep, chairman of the international relations committee, told of plans for the European tour and introduced A. G. Swope, Thomas Cook & Son, who told of the tour.

Many unusual features characterized the annual banquet, held, Wednesday evening. President S. T. Johnston in introducing those at the speakers table commented on the fact that a Chicago convention was greeted by a Chicago president. The directors and officers elected were presented to a gathering of more than 400 guests.

G. H. Clamer, past president of the American Foundrymen's association, for 20 years a warm friend and associate of the late Jesse Lee Jones delivered the presentation address in presenting the Joseph H. Seaman medal. This medal award was voted shortly before the death of Mr. Jones. Mr. Clamer spoke of the versatility which characterized Mr. Jones' contributions to metallurgy and manufacturing processes of cast metals, as was shown by his work on various special purpose bronzes, his accomplishment in all nonferrous lines and in later years by his important work in gray iron.

Mrs. Jesse L. Jones in receiving

Pays Tribute to Foundry Industry

BY THE unanimous vote of the board of awards of the American Foundrymen's association, the Joseph S. Seaman medal was presented posthumously to the late Jesse Lee Jones in recognition of his contributions to the association and to the foundry industry. The medal was presented by G. H. Clamer, a past president of the association and a member of the board of awards. In a splendid response, Mrs. Jesse Lee Jones paid high tribute to the importance of the metal working industry in the functioning of modern civilization. Mrs. Jones in effect gave the creed of the foundry industry when she said:

"The metal industry, in which you are engaged, is an essential, a basic industry. On its broad foundation rests all the manufactures, all the transportation, all the commerce of the world. In the heat and dirt and labor of the foundry, in the exacting and tedious toil of the laboratory, may you never forget the intrinsic value of your work. The strength and reliability of the iron, steel, and aluminum, the copper, brass and bronze which you produce determine the safety and success of our whole modern industrial life. The progress of this great mechanical age waits on your research. I believe it was because my husband so clearly visioned this that he loved this work, and because he loved it, he attained success in it."

the medal gave an excellent address, speaking with feeling of the high ideals which had governed her husband's work for the foundry industry.

Dr. Siegfried G. Werner, Dusseldorf, Germany, chairman of the Foundrymen's International committee presented the greetings of his own association and the international committee. Following the banquet, a reception and dance was tendered by the American Foundrymen's association.

Study Cast Iron Metallurgy

AN EXTENSIVE paper by A. L. Boegehold, metallurgist of the General Motors Corp., Detroit, on "The Quality of Pig Iron and Castings as Affected by Blast Furnace Practice," held the close attention of about 300 members at the sessions on cast iron metallurgy, Tuesday morning. Quality of the coke and amount of water in the blast constitute two of the most important variables that affect the quality of the pig iron. Means of controlling these two variables were described.

The prime requirement on the part

A. L. Boegehold, General Motors Corp., Detroit, Gave a Paper on the Effect of Blast Furnace Practice on the Quality of Pig Iron

of every foundryman is a uniform pig iron, one in which the physical characteristics will be reproduced with regularity in the castings. To secure iron of that character, it will be necessary to start at the blast furnace and eliminate some of the exceedingly wide variations that exist in present practice. Eventually it is hoped that foundrymen confidently may be able to take pig iron of similar chemical analysis and classify them in something like the manner in which steels of similar analysis have been subdivided into fine-grained and coarse-grained, fine-grained normal, coarse-grained normal, fine-grained abnormal, etc. Part I of that paper appears in the April 15 issue of THE FOUNDRY.

Problems confronting the cast iron foundryman today were discussed at length in a paper by Frank Hudson, Glenfield & Kennedy, Ltd., Kilmarnock, Scotland, entitled "Science Hand in Hand with Labor," which was presented at the session on iron founding practice on Wednesday morning. This is the annual exchange paper of the Institute of British Foundrymen, and in the absence of Mr. Hudson, was presented by Oliver Smalley, New York. Among the various problems discussed in the paper are the selection of iron that will fill the requirements of the average jobbing shop, cause of porosity and shrink holes, effect of various elements on the total carbon, essentials of good cupola practice, suitable mixtures, the testing of loam mixtures containing core oils.

Nickel Added to Iron

The second paper, presented by F. B. Coyle, International Nickel Co., Bayonne, N. J., represents a study of a 36-inch cupola which was made with the idea of improving the quality of cast iron produced at the New York navy yard, Brooklyn, N. Y. As a result of the study, the author concluded that by careful analysis and control of cupola operation, it was possible to improve the tensile strength nearly 30 per cent and to maintain a brinell hardness between 200 and 220.

The paper created considerable discussion among the 300 foundrymen present. David McLain, Milwaukee, agreed with the author in regard to the height of the bed, which was given as 24 inches. Mr. Smalley took exception to this and stated he believes in a high coke bed, usually starting with 36 inches. Mr. McLain stated that he had found a bed of 18 to 22 inches the best for Connellsville coke and one of 22 to 26 inches the best for by-product coke.

In reply to a question regarding the proper order for charging steel, pig iron and scrap, Dr. Moldenke, Watchung, N. J., stated that he usually places the steel on the coke, then the pig and the scrap in order. However, he mentioned that the size of the steel sections governs the place in the cupola. J. D. Stoddard, Detroit Testing Laboratory, Detroit, called attention to a statement in the paper that sulphur was not affected by the amount of return scrap used. It was pointed out that this is not the case, but that the more returned scrap used in the mixture, the higher the sulphur in the cast iron produced. James T. Mackenzie, American Cast Iron Pipe Co., Birmingham, Ala., pointed out that the amount of surface exposed to the flame also affects the amount of sulphur absorbed from the gas.

"An Analysis of 54-inch Cupola Performance" was the subject of a paper presented by Edward E. Marbaker, Whiting Corp., Pittsburgh. In the paper, the author presents detailed information on the operation of 16 different cupolas, eight straight lined and eight boshed in the melting zone. He determines the thermal efficiency of each of these cupolas, and then constructs graphs which will enable the foundryman to determine the thermal efficiency of his cupola with greater ease.

W. F. Graham, Ohio Brass Co., Mansfield, O., Read a Paper on Sand Control in a Brass Foundry

Considerable interest was displayed at the session on high test cast iron Thursday afternoon, at which Dr. H. F. Moore, University of Illinois, Urbana, Ill., presided. The annual exchange paper of the Association Technique de Fonderie, France, which was prepared by R. P. Lemoine, French Foundry Technical association, Paris, France, on the subject "High Test Cast Iron," was discussed by R. S. McCaffery, University of Wisconsin, Madison, Wis., in the absence of Mr. Lemoine. The paper was divided into two main parts, the first discussing the various scientific results which are at the basis of the modern tendency in high test cast iron and the second part treating with the development of the practical side of the question during the past few years.

The manufacture of alloyed cast irons in France is discussed and the various melting processes described. Melting may be accomplished in the cupola, the electric furnace or by the duplex process, which consists of melting the iron in the cupola and re-

fining it in the electric furnace. The author concludes that a sound basis of production of high test cast iron has been the semisteel process; that the development of the electric furnace in foundries has given place to the single and duplex processes which permits adopting compositions of low carbon and high silicon; and that the careful study of melting scrap in cupolas for the duplex process coupled with the knowledge that some kinds of scrap have a slow carburization have resulted in the establishment of an interesting cupola process.

E. E. Marbaker, Whiting Corp., Pittsburgh, presented a paper outlining developments in high test cast iron which outlined various processes. Mr. Marbaker stated that since he had written the paper, he had found a new method that was being used in Germany. The metal was melted in a kiln type furnace called the Brackelburg furnace which is fired with powdered coal. It is charged and fired from the opposite ends and tapped from the middle. The metal is melted, not by the heat of combustion directly but by the heat reflected

Eugene W. Smith

from the walls of the furnace. This furnace, when the metal first is charged is rocked until the metal is melted and then rotated completely.

Fritz Meyer, National Radiator Corp., Johnstown, Pa., quoted Piwowarsky and Dr. Nipper on recent developments in European, especially German foundry practice. He spoke of the recent formation of an association for utilizing the various processes for making high test iron. He also told of the various methods for producing and some of the advantages of high test cast iron.

F. B. Coyle, International Nickel Co., New York, told of the use of nickel and chromium alloys in cast iron. He explained Maurer's diagram and discussed Piwowarsky's results in the production of high test cast iron. R. S. MacPherran, Allis-Chalmers Mfg. Co., Milwaukee, gave some data on the production of alloy cast iron at Allis-Chalmers Mfg. Co. plant at West Allis, Wis.

H. Bornstein, Deere & Co., Moline, Ill., gave results obtained in the production of high test cast iron in various sized cupolas. He also discussed the use of various alloys in the production of cast irons. O. Smalley, Brooklyn, N. Y., said that the production of high test cast iron was not a new development but that it was slow in being developed. He quoted several reasons for the recent work along that line and stressed the need of metallurgical control in the foundry industry. He spoke of the properties of high test cast iron and the various methods used to produce the desired properties.

Cupola a Feature of Shop Course

FACTORS entering into a formula for determining the proper area of gates in relation to castings provoked a lively and prolonged discussion at the first of the technical sessions at 4 p.m. Monday. This session was the first of four scheduled for presentation on practical

V. A. Crosby, Studebaker Corp., South Bend., Ind., Discussed Core Oil Testing and Specifications

shop problems and practice, one on each of the four days the convention remained in session. Other sessions included "Sand Control Fundamentals," on Tuesday, "Cupola Control," on Wednesday, and "Cupola Melting Operations," on Thursday.

In opening the discussion, H. W. Dietert, United States Radiator Corp., Detroit, explained a formula he has developed for regulating the size of gates. This formula is based on the pouring time and is calculated from the weight of the casting, the thickness of section, total area and height of the pouring head. In the ensuing discussion it developed that other factors frequently had to be considered. The proposed formula gives the total area of the passage required, but in the majority of cases several small inlets must be provided to distribute the metal properly and the individual area of each of these inlets and their location depended on local conditions. As an extreme instance of this kind, Dr. Moldenke pointed out that a ladle with 14 spouts was employed to pour long pipes horizontally in a southern foundry. E. W. Smith, Crane Co., Chicago, showed how the location of the gates exerted an important influence in securing straight castings. Another variable factor involves the temperature and fluidity of the metal and this in turn led to a discussion of the analysis.

Discussion of materials used in the cupola, pig iron, scrap, steel fluxes and coke, provoked comment over a wide range of details on Wednesday afternoon. David McLain, Milwaukee, stated that originally only pig iron and steel scrap were employed in the proportion of approximately 75 per cent pig iron and 25 per cent steel to make semisteel, but that now a great many combinations are employed. He also emphasized the fact that steel still is the necessary foundation of all cast iron mixtures in which high strength is a requisite.

Character of the steel scrap and size of the pieces depend on local conditions. Sections of steel rails cut to suitable lengths to suit the inside

R. W. Kurtz, Jas. B. Clow & Sons, Newcomerstown, O., Discussed Sound Castings

diameter of the cupola are the most satisfactory for several reasons including handling, but any kind of steel scrap will serve. Thin plate scrap may be employed if the blast pressure is reduced. With a high blast, thin steel will be lost through oxidation. He stated that stove founders now are using 10 per cent steel in their mixtures. A hot cupola at the beginning of the heat is a prime requisite in the melting of a semisteel mixture of any kind.

G. S. Evans, Mathieson Alkali Works, New York, stated that the object of introducing flux into a cupola is to improve combustion and help wash impurities from the metal. The amount of limestone necessary to flux

David Zuege, Sivyer Steel Casting Co., Milwaukee, Presented a Paper on Alloy Steel Castings

a cupola properly depends on the character of the coke in the charge and the amount of lime in the limestone. Limestone in which the insoluble silica exceeds 5 per cent is not suitable for cupola fluxing purpose. Limestone should be placed in every charge, preferably on the coke, commencing with the bed.

E. J. Lowry, Detroit, described the manufacture of pig iron and pointed out the futility of expecting uniform iron from widely separated stacks operating under widely different conditions. He also referred to the advantages of using small pigs.

J. T. MacKenzie, American Cast Iron Pipe Co., Birmingham, Ala., explained that chemical composition of coke, physical properties and lump size play an important part in melting, also in determining the carbon content of the resulting metal, especially in mixtures where steel is employed. He quoted several coke analyses to show wide divergence obtaining in carbon content.

According to F. K. Vial, Griffin Wheel Co., Chicago, coke seems to have monopolized most of the attention in cupola discussion, when in reality two elements coke and air are equally important. With the aid of a series of tables and illustrations presented at the last of the gray iron shop sessions, he demonstrated the theory of combustion to secure the most satisfactory results. He strongly advocated taking gas analysis to determine the melting conditions inside the cupola. In answer to a question from the floor he recommended taking the test gas from a point at the charging door sill. The relation of CO and CO_2 is the real key to cupola operating efficiency and should be watched closely.

With slight variation depending on the size of the cupola, the best height for a cupola is 2½ times the diameter. A theory held at one time that an extremely high stack is conducive to efficient melting through absorption of heated gas from lower in the stack, was claimed to be mistaken. Under proper operating conditions all the heat that might be of use is absorbed before the gas ascends to any great height.

C. J. Scullin, deplored the tendency

F. A. Lorenz, Jr., American Steel Foundries, Chicago, Gave a Paper on the Efficient Grinding of Steel Castings

of many cupola operators to neglect proper lighting. A cupola properly lighted means a smoothly running heat, while a fire improperly started will cause unsatisfactory conditions throughout the duration of the heat. On short heats this feature may not be so important, but it is particularly undesirable on long heats. An oil or gas torch is the most satisfactory medium for lighting the coke, but wood yields satisfactory results if it is handled intelligently. Refrain from piling too much coke at the beginning. A second feature is the necessity of allowing sufficient time for the coke to burn up before starting the blower.

Consider Personnel Training

COMPETITION from without the industry was given as an important reason for furthering apprentice training work at the session on that subject Thursday morning. L. A. Hartley, National Founders association, Chicago, presided at the meeting. In a paper on "Why We Train Apprentices," J. A. Davies, Westinghouse Electric & Mfg. Co., Philadelphia, stated that the course was established at his plant to get better foundry work. He pointed out that for years science and the universities have neglected the problems of the foundry industry, but that this condition now is changed with a result that the industry will benefit. In speaking of substitutes for castings he stated that the appearance of the welded structure in machinery is not anything like that of a gray iron casting.

He believes that designers of machinery have been wafted along by the changing styles and now have gone too far toward welded structures. Many parts which now are made of welded steel would look better and be better if made of cast iron. To meet this competition the foundry must have trained personnel

Henry Biegle, Robert Crawford and J. L. Mahon

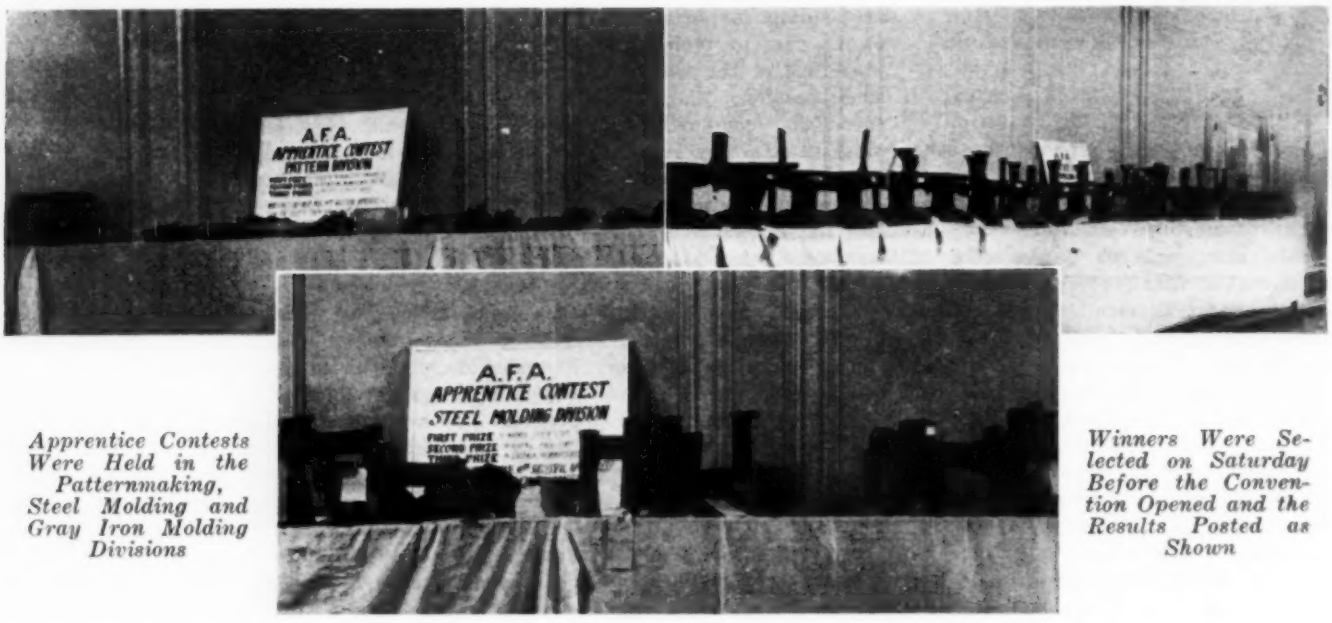
capable of producing a product which meets the demands of the designer of machinery regarding weight, cost and time required for production. Trained workers of the type necessary may be secured through the apprentice training courses.

A. E. Harrison, Allis-Chalmers Mfg. Co., Milwaukee, told of the work on apprentice training that is being done at his company, when discussing the paper of Mr. Davies. He has about 50 boys receiving training as apprentices and some exceedingly satisfactory results have been obtained. Mr. Harrison also stated that there are some structures which may be made as well by welding as by casting, but that there are many intricate castings used on various types of machinery which will not be welded for a long time to come.

A. M. Cornell, Pettibone Mulliken Co., Chicago, presented a paper entitled "How We Train Apprentices." Mr. Cornell explained the methods used in selecting boys for the ap-

prentice courses and told of the methods of administering the work. He also stated that the type of work made by the Pettibone Mulliken Co. is not adaptable to welding.

F. A. Lorenz, American Steel Foundries, East Chicago, Ind., presented a series of charts to show some facts regarding the apprentice system in the East Chicago district. Data collected over a period of time shows that the lowest turnover in apprentices is realized among boys having a higher education. Several work rates to apprentices when it becomes necessary to place them on that type of work. Mr. Cornell, Mr. Harrison, John Ploehn, French & Hetch, Davenport, Ia., and C. J. Freund, Falk Corp., Milwauwkee, all thought that apprentices should be placed on the piece work rate when called upon to do that type of work. Mr. Freund declared that it should be clearly understood before the boy is placed on the piece work rate that he must go back to the day rate when the necessity of his working on ing contest were G. Warneck, Sivyer Steel Casting Co., Chicago; H. Poepke, Falk Corp., Milwaukee, and M. Gadzala, Hubbard Steel Foundry Co., East Chicago, Ind., in the order named. Judges in this group were C. N. Ring, Electric Steel Founders' Research group, Chicago; John Marr, Chicago Steel Foundry Co., Chicago, and George Fisher, Burnside Steel Foundry Co., Chicago. Winners in the patternmaking group were H. Smith, Milwaukee Pattern Mfg. Co., Milwaukee; V. Tatewossian, Brown



Apprentice Contests Were Held in the Patternmaking, Steel Molding and Gray Iron Molding Divisions

Winners Were Selected on Saturday Before the Convention Opened and the Results Posted as Shown

of the men present expressed the desire to obtain boys with some high school education, but a few considered this impossible in their localities.

In discussing the papers presented, E. H. Ballard, General Electric Co., West Lynn, Mass., deplored the effect that statements in certain literature on welding apparatus is having upon the young men who may be considering apprentice courses. After reading some of the literature telling of the replacement of castings with welded parts, the youth is likely to doubt the possibilities for the future of the molder and the patternmaker. Mr. Ballard expressed the opinion that the pendulum has swung too far in the wrong direction and that it will soon come back. He asked that designers give the foundryman a pattern as simple in design as the welded structure and the foundryman will produce a cast part that will serve the purpose better. He stated that it is necessary to get the apprentice to thinking on the possibilities of making structures of cast parts rather than of welded parts.

Considerable discussion resulted from a statement in Mr. Cornell's paper regarding the payment of piece- that particular job is over. F. K. Ferguson, supervision of apprentices, East Chicago, and several others thought it not advisable to put apprentices on piece work. C. J. Freund, Falk Corp., Milwaukee, and chairman of the apprentice committee, reported on the apprentice contest.

Make Apprentice Awards

Increasing interest displayed in the annual apprentice contests in patternmaking, steel molding, and gray iron molding is attested by the number of entries in each division this year. Contestants numbered 11 in the steel molding group, 22 in the gray iron group and 20 in the pattern making division. Judging in each class was under the grade system which allowed a certain value for such items as time of completing the work, workmanship, appearance, soundness, gating, risers, etc. Entrants in the steel molding and patternmaking sections were complimented by the judges on the uniform excellence of work submitted. The gray iron molding had considerable variation from the lowest to the highest.

Award winners in the steel mold- & Sharpe Mfg. Co., Providence, R. I., and S. Morroto, Fletcher Works, Philadelphia; Charles Johnson, Western Electric Co., Chicago; William Beck, Western Foundry Co., Chicago; George Ross, Lewis institute, Chicago, and Edward Sabey, Miehle Printing Press Co., Chicago, were the judges in the patternmaking division.

In the gray iron molding group, N. F. Chapman, Browne & Sharpe Mfg. Co., Providence, R. I.; C. W. Hansen, Browne & Sharpe Mfg. Co., and A. Lachowicz, Calumet Foundry & Machine Co., East Chicago, Ind., were winners of the awards in the order named. Judges in this section were Louis Weckerly, Ferguson & Lange Foundry Co., Chicago; C. L. Larsen, Armour Institute of Technology, Chicago, and W. A. Cureton, W. A. Jones Foundry & Machine Co., Chicago.

Discussions at the session on foreman and foremanship training Thursday afternoon, presided over by G. E. Bergstrom, director of personnel, Pettibone Mulliken Co., Chicago, centered on relative merits of the conference plan as against other courses and methods, frankness in foreman training as to company policies, train-

ing on company time, stimulation of foremen interest, inducing management to accept the training idea, and extension of training to apprentices. The general view was that training should be on company time.

The discussions also emphasized the beneficial results of interdepartment contacts. It was pointed out by several that training should be after working hours in the smaller plants, and that sometimes overtime pay is involved with compulsory attendance, although others advocated voluntary attendance. Reports indicated the conference method, with or without supplemental texts, predominates in foremanship training. It was suggested that the United States chamber of commerce bulletin on the subject of foremanship gives important data as to scope of the work. The importance of foremen reading the technical and business publications in their particular field also was stressed.

Problems of selling foremanship training to management involve objections as to training experienced foremen who have served many years, it was brought out by speakers who pointed out that methods and ideas of experienced foremen oftentimes do not meet changing needs. Some expressed the view that the conference method should be supplemented also by personnel technical coaching on the job by management, as well as pretraining of foremen for his job. A typical conference method session was demonstrated.

W. F. Coleman, W. A. Jones Foundry & Machine Co., Chicago, in his paper stressed the importance of management sponsoring the training, and of competent teaching. A. R. Pierce, director of the department of industrial education, National Metal Trades association, Chicago, advocated the conference plan, with blackboard analysis, and the use of supplementary text or lesson sheets. Best results, he said, are obtained from small groups of 15 to 18. Visits by company executives to training sessions should be limited to five minutes or less.

M. H. Mellen, supervisor of education, General Electric Co., West Lynn, Mass., cited results from conference training in which minutes of opinions and conclusions are kept but names of those discussing questions are omitted, advance papers on subjects being distributed before the meetings. He said that in the last three months the training has been extended to apprentices, with good results. G. A. McGarvey, industrial education agent of the federal board for vocational education, Washington, suggested that more use be made of the city and state boards for vocational education. "Sarcely any basic industry has not been served by some form of foreman training," he said.

A. D. Lynch, personnel director, Ohio Brass Co., Mansfield, O., declared the problem of foreman training is essentially a problem of management, and suggested meetings should be held after working hours.

L. A. Hartley, educational director, National Founders' association, Chicago, emphasized the human relations in foreman training and said there is no longer a question as to its necessity.

Probe Steel Foundry Problems

ABOUT 200 steel foundrymen were present at the steel session held Tuesday morning under the chairmanship of S. W. Utley, Detroit Steel Casting Co., Detroit. A report of the joint committee on the effect of phosphorus on steel was presented by R. A. Bull, Electric Steel Founders' Research group, Chicago. Mr. Bull stated that work on physical tests of the bars made last year is progressing slowly and that insufficient progress has been made to justify conclusions. However, according to a recent communication from Dr. Langenburg, announcement of some results may be made at the June meeting of the American Society for Testing Materials.

David Zeuge, Sivyer Steel Casting Co., Milwaukee, presented a paper on alloy steel castings which was discussed by A. W. Lorenz, Bucyrus-Erie Co., Milwaukee; A. C. Jones, Lebanon Steel Foundry, Lebanon, Pa.; A. H. Jameson, Malleable Iron Fittings Co., Branford, Conn.; and C. E. Sims, American Steel Foundries, East Chicago, Ind. Following this discussion F. A. Lorenz Jr., American Steel Foundries, East Chicago presented a paper on the grinding of steel castings in which he stated that through a careful analysis of grinding conditions, his firm was able to reduce its costs 30 per cent with the grinder making the same wage as he did under former methods. This paper was discussed by E. H. Ballard, General Electric Co., Lynn, Mass.; H. P. Evans, Pettibone-Mulliken Co., Chicago; and K. L. Pohlman, Rotor Air Tool Co., Cleveland.

A. H. Jameson, Malleable Iron Fittings Co., Branford, Conn., presented the report of the committee on steel castings. He said that the committee at this time did not believe it advisable to devise a number classification similar to that of the S.A.E. He also mentioned that indications point to an adoption by the A.S.T.M. of a revision in its specification A95-28T on steel castings for valves, flanges and fittings for high temperature service. This revision will read as follows: "The steel may be made by the open hearth, electric or other process approved by the purchaser," and which makes mandatory the chemical limitations which previously have been included in the specification merely as recommended practice, at the same time raising the sulphur limits from 0.05 to 0.06 per cent.

Following the luncheon arranged for the steel foundry group 100 members and guests participated in a lively discussion on the causes of porosity in steel castings under the direction of R. J. Doty, Reading Steel Casting Co., Reading. Discussion was limited, by consent, to one particular type of porosity known as pin holes which are found just under the skin after annealing and machining the casting.

One member stated that investigation proved porosity was due to a metal condition caused by the metal not being worked thoroughly. Another said that he found that it was caused by metal being poured too hot and it could be eliminated by changing the sand condition or cooling the metal. According to another speaker, the metal condition was to blame. He found that this could be stopped by the addition of silicon at the proper time, or, as he determined, at the point where a slight boil occurred. Silicon added before or after that period may cause gas holes. Pressure of the gas from the mold on the liquid or pasty metal was suggested as a cause. If the metal is degasified thoroughly before pouring it can absorb considerable gas before pin holes would show. If the pressure was not too great pin holes would not be evident.

Moisture content in the sand also contributes to that type of porosity it was pointed out. That condition was determined by pouring steel into

duplicate castings that had re-entrant angles. One of the castings was in green sand and the other in dry sand; the two being on a common gate. When the moisture was not right, the pin holes appeared. They are attributed to the acute pressure developed through the breaking up of moisture into hydrogen and oxygen. At the re-entrant angles, the pressure was doubled, and porosity appeared at such points quicker than at others.

Over reduced steel was another condition mentioned. It was stated that this was due to the steel's ability to absorb gases avidly when molten, but which could not be retained when solidification took place. Reaction between iron oxide and carbon in the steel was suggested as another cause. The iron oxide and carbon react to form carbon monoxide which is retained by the metal until solidification takes place when it is ejected but not entirely. One member cautioned against careless addition of silicon, and stated that it should be added at a predetermined time before pouring which would be set by the capacity of the molding floor to take care of the metal. Unless this is done, the metal may contain oxides or gases.

Introduces Steel Shop Course

THE first of the steel foundry shop operation course meetings on Monday was attended by approximately 50 steel men, and a lively discussion ensued. The session marked the introduction of that type of meetings for steel foundrymen.

A. M. Cornell, Pettibone-Mulliken Co., Chicago, Described Apprentice Training Methods

C. N. Ring, Electric Steel Founders' Research group, Chicago, presided, and in his introduction gave an outline of the various problems that would be encountered in steel pouring practice. He then called upon F. A. Burtt, Pettibone-Mulliken Co., Chicago, who gave a short talk on the types of ladles used in his plant. A basic lined teaspout ladle is used for pouring manganese steel, and a bottom pour type for pouring acid carbon and alloy steels.

C. E. Wilson, American Steel Foundries, East Chicago, Ind., stated that his firm employed bottom-pour ladles because a cleaner steel was obtained. He said that molds should be poured as fast as possible and that the thin section castings should be poured first. Mr. Wilson advocated a ladle height of 6 inches above the mold to obtain a solid stream. His experience was that a broken stream caused blowholes due to inspiration of air in the stream as it descended.

Relation of temperature and fluidity of molten steel was discussed by D. Zeuge, Sivyer Steel Casting Co., Milwaukee. He said that from investigations carried out he believed that steels poured at the same temperature did not always possess a like fluidity. The fluidity test used consisted of a vertical bar ⅜-inch square and 15 inches high. This was connected by a cross gate to a 1-inch square gate with a large pouring basin. The specimens all were poured at 2775 degrees Fahr. as measured by an optical pyrometer.

C. E. Mooney, Falk Corp., Milwaukee, passed a drawing showing his firm's method of making a stopper rod. He also showed a stopper head grinder made of silicon carbide and a part of a steel casting to show the effect of wet sand. After each leader presented his topic a number of questions were asked and discussion developed. Those entering the discussion included D. W. Merriman, Keystone Driller Co., Beaver Falls, Pa.; S. R. Robinson, Industrial Works, Bay City, Mich.; J. E. Graham, Omaha Steel Works, Omaha, Neb.; Mr. Bryant, American Steel Foundries, East Chicago, Ind.; R. A. Bull, Electric Steel Founders' Research group, Chicago.

The Wednesday session of the steel foundry operation course was devoted to a discussion of core room practice, with A. C. Jones, Lebanon Steel Foundry as chairman. E. R. Young, Detroit Steel Casting Co., Detroit, discussed the various tests for core sand. He stated that the tests for strength, moisture and green bond have been standardized by the American Foundrymen's association, and that considerable work had been done in developing a test for permeability. He believes that it will not be long before a device will be developed to permit permeability tests being made on the same machine that now is being used to determine the permeability of molding sand.

F. B. Coyle, International Nickel Co., New York, Reviewed Experiments on 36-Inch Cupola Operation

In discussing the surface of cores, it was stated that the metal will lie better against a core having a good strong surface and a weak backing. D. Zeuge, Sivyer Steel Casting Co., Milwaukee, expressed the opinion that cracking depends on the thickness of the casting section. An interesting feature of the meeting was a discussion of continuous type core ovens by T. P. McVicker, Young Bros. Co., Detroit, several types were described.

C. M. Saeger Jr., bureau of standards, Washington, described the work that has been done by the department in experimenting with a rubber bond for foundry cores. He exhibited a number of samples in

Discussing the Weighty Problems of the Convention

which rubber was used as a binder. At the close of the meeting, D. W. Merriman, Keystone Driller Co., Beaver Falls, Pa., told of using asbestos boards as core plates.

The closing session of the course on steel foundry shop operation was held at 4 o'clock Thursday with John Howe Hall, Taylor-Wharton Iron & Steel Co., High Bridge, N. J., presiding. Heat treatment of steel was discussed. Composition, size, design, service and specifications have much to do with the choice of heat treatment according to the speakers. With an increase of intercrystalline growth, an increase of impact resistance is noted.

Two heat treatments are necessary to obtain the best physical properties and three treatments generally will produce better results. One speaker remarked that with each 100 degrees increase above the upper critical range, a doubling in speed of solution is noticed. Mention also was made of the effect of aluminum additions on lowering of ductility of steel.

Handling Materials

INTENSIFIED interest in materials handling was indicated by the attendance of more than 75 men at the materials handling session Wednesday morning at which Dan M. Avey, THE FOUNDRY, Cleveland, presided. Many small foundry companies were represented and in addition executives from the larger automotive foundries and from equipment manufacturing firms contributed to the discussion.

In the absence of R. J. Heisserman, Link Belt Co., Philadelphia, his paper tracing the history and development of mold handling was presented by J. J. Hartley of the Chicago office of the Link Belt Co. E. F. Scott, Ohio Foundries Association, Inc., Cleveland, commented on the interest of smaller foundries in inexpensive conveying units for mold handling. R. M. Scott, Packard Motor Car Co., Detroit, told of the reduction from 180 to 67 men in his plant due to the installation of proper handling equipment on one class of work and pointed out that this saving in labor had been accompanied by a reduction of 50 per cent in scrap losses. He said that it is possible to handle weights up to 3600 pounds on a sliding type conveyor.

J. E. Linabury, Oakland Motor Car Co., Pontiac, Mich. pointed out that mold handling is only a portion of the problem of transfer of materials in the foundry. The moving of castings through various operations, disposal of waste materials and delivery of cores all are important. In the new plant recently constructed under Mr. Linabury's direction, nine different types of conveyors are employed. Trucking alone gives four times the production on half the floor space which would be required without this trucking service. He advised attention to a method of removing waste sand and dust arrester refuse by the addition of water and pumping the liquid mass to the dump by sludge pumps.

A. C. Jones, Lebanon Steel Foundry, Lebanon, Pa. questioned the type of flasks and bottom boards for use on roller conveyors. J. H. Hough, Mathews Conveyor Co., Elwood City, Pa. said that snap flasks may be employed with advantage and bottom boards carrying four or five molds, wide enough to cover the ends of the rollers to guard against damage from runouts, are recommended.

Albert Walton, consulting engineer, United Engineering & Foundry Co., Pittsburgh, read an abstract of his paper reviewing the general field of gray iron foundry handling and the economics of handling equipment in such service. D. B. Hill, Jr., Palmer-Bee Co., Detroit, in a written discussion told of savings possible through application of core oven handling machinery. E. T. Bennington, Cleveland Crane & Engineering Co., Wickliffe, O., spoke of the advantages of standardization on certain types of equipment with which the foundryman becomes thoroughly familiar.

D. W. Merriman, Keystone Driller Co., Beaver Falls, Pa. asked whether any foundrymen present had experimented with asbestos sheets used as core drying plates. He reported that he had used such plates successfully in drying small cores and that he found them satisfactory, even without any provision for under ventilation to assist heat transfer.

Henry O. Haughton, Chevrolet Motor Car Co., Saginaw, questioned the practice of weighing cupola metal prior to delivery to the charging floor for handling by magnetic charging machinery.

Study Scrap Problems

MORE than 300 foundrymen crowded into the large meeting room Tuesday afternoon to hear the discussion of problems of general foundry management and practice. President-elect Fred Erb presided.

E. K. Smith, metallurgist, Stockham Pipe & Fittings Co., Birmingham, Ala., presented a paper on the use of scrap in gray iron malleable and electric steel mixtures. The paper, prepared by Mr. Smith and F. B. Riggan, associate metallurgist of the company, deals with the economic situation surrounding the use of scrap and with the results of experimental heats with various scrap mixtures. The authors conclude that in the future the processes and selection of materials must be under closer control and they predict that scrap yards will be "equipped with briquet machines, balers, furnaces, magnetic separators and even chemical laboratories."

E. J. Lowry, Fisher building, Detroit, discussed the economic features of the scrap problem, stating that sorting and preparation of scrap by the foundryman represents an item of expense that must not be overlooked. He declared that in certain localities a differential of at least $3.50 to $4.00 between scrap and pig iron must prevail if scrap is to be used economically. His statement that at least two companies are using briqueting machines for borings and turnings prompted F. J. Wall, Wilson Foundry & Machine Co., Pontiac, Mich. to review briefly his experience with a machine of that kind. He declared that the equipment, which cost $40,000 and produces briquets 4 inches in diameter 3½ inches long, has proved satisfactory. He declared it paid for itself in six months and stated in reply to a question that the briquets seem to require less fuel. Among the others who discussed the scrap problem were J. T. MacKenzie, American Cast Iron Pipe Co., Birmingham, Ala., and Chairman Erb, who referred to difficulties experienced with oxidized metal.

A paper entitled "Baking Practice for Oil Sand Cores" by H. L. Camp-

bell, University of Michigan, Ann Arbor, Mich., was read by title in the absence of the author. V. A. Crosby, Studebaker Corp., South Bend, Ind., discussed tests and specifications for core oils.

In the final paper of the session, F. H. Elam, American Steel Foundries, Chicago, outlined safety considerations for foundries, emphasizing the need for instructing workmen in safe working practices.

Cost Estimates Vary Widely

INTERESTING points in determining costs in gray iron and nonferrous foundries were brought out at the cost session presided over by A. E. Hageboeck, Frank Foundries Corp., Moline, Ill., on Tuesday morning. At the beginning of the session two problems were passed out, one for the gray iron foundrymen present and the other for the nonferrous members at the meeting. The gray iron problems consisted of determining the cost on 100 pounds of gray iron castings, figuring the cost of molding labor at $1.50, and core labor at $0.80. The work was molded on the bench and no profit was added.

Oliver Smalley, Brooklyn, N. Y., Read a Paper on American Developments in High Test Cast Iron

These problems were collected and classified and it was found that the cost estimates ranged from $2.10 to $11.00 per hundred pounds of castings, with a spread of over $8 between the low and high. E. T. Runge, Cleveland, in his talk on "Practical Aspects of the Value of Foundry Cost Methods" presented his idea of a representative cost estimate on this same job. He figured the metal cost at $1.52, molding at $1.50, molding expense at $3.00, core labor at $0.80, core expense at $1.20, giving a total of $8.02 for the 100 pounds of castings.

The nonferrous problem dealt with the cost of 100 pounds of castings having a composition of 85-5-5-5. Copper cost $0.25, tin $0.50, lead $0.08, zinc $0.08½, molding labor $2.00 and core labor $0.50. No profit was added. Results showed a spread from $32.75 to $56.75 per hundred pounds of castings. The costs given by Mr. Runge are as follows: Metal $25.87, conversion $2.00, molding $2.00, molding expense $4.00, core labor $0.50, core expense $0.75, with a total of $35.06 for the castings.

Mr. Runge pointed out that costs could be divided into four divisions, namely molding, melting, cleaning and core making. He stated that numerous methods are used to determine cleaning costs, but that he has found the best results are obtained by charging the cleaning costs, as a percentage of the molding labor. He stated that it is not accurate to figure cleaning costs on a weight basis, since it is the surface that is cleaned and that the surface is not necessarily a function of the weight.

J. J. Cadot, Steacy-Schmidt Mfg. Co., York Pa., stated that his company had experimented with a number of methods of charging the cleaning room expense and had come to the conclusion that the nearest approach to an accurate figure may be secured by charging the cost as a percentage of the sum of the direct molding cost and the direct core cost. Peter J. Krentz, Buffalo Foundry & Machine Co., Buffalo, stated that his company does not figure costs on the percentage basis but endeavors to determine the cost on each individual casting according to departments.

Low Melting Loss

In discussing the period that should be used to determine cost percentages, Charles F. Gilbert, Gilbert Brass Co., St. Louis, stated that there are good months and bad months, good years and bad years. For that reason his company has taken the percentage figure on a basis of 5 years. In answer to a question by Charles Hoehn, Enterprise Foundry Co., San Francisco, regarding the melting loss in the electric furnace, H. M. St. John, Detroit Lubricator Co., Detroit, stated that over a period of 2 years, melting an alloy of 80 per cent copper, 2½ per cent tin, from 5 to 10 per cent lead and from 7 to 8 per cent zinc in an electric furnace, the melting loss averaged 1.65 per cent. Approximately 1/3 of this was the actual melting loss and the remainder was due to pouring, cleaning and recovering losses. N. K. B. Patch, Lumen Bearing Co., Buffalo, mentioned that results at his plant checked with those of Mr. St. John.

Mr. St. John also stated that the melting loss was determined by different methods. Some weigh the casting and risers after they are cooled. Others weigh the metal in the ladle. However, the results obtained by these methods will not check since the loss resulting from pouring the metal into the mold will about equal the melting loss. W. F. Graham, Ohio Brass Co., Mansfield, O., stated that comparative tests on different types of melting equipment showed that the loss when using oil fired furnaces was 3½ per cent, when melting in crucibles 3 per cent and when using the electric furnace 1.35 per cent. These percentages were determined after recovering all salvage.

J. A. Davies, Westinghouse Electric & Mfg. Co., Philadelphia, told "Why We Train Apprentices"

Considerable discussion resulted from numerous questions asked on both gray iron and nonferrous costs. Among those taking part in these discussions were B. G. Parker, Youngstown Foundry & Machine Co., Youngstown, O.; M. W. Baker, Illinois Foundry Co., Springfield, Ill.; Albert Weber, Wilson Foundry & Machine Co., Pontiac, Mich.; T. A. Lavelle, Lavelle Foundry Co., Anderson, Ind.; E. J. Thomas, Progressive Brass Mfg. Co., Kansas City, Mo.; J. M. McDonald, Jr., A. Y. McDonald Co., Dubuque, Ia.; J. B. Meier, F. & H. Foundry Co., Newark, N. J.; John Diedrich, Blackhawk Foundry Co., Davenport, Ia.; and N. A. Doolittle, Progressive Brass Co., Tulsa, Okla.

Immediately following the adjournment of the general session on foundry costs, held Tuesday morning, a group of 130 nonferrous foundrymen met at lunch to discuss the problems of cost peculiar to their branch of the industry. E. B. Hazen, Brass Foundry Co., Peoria, presided. John

Diedrich, Black Hawk Foundry Co., Davenport, Iowa outlined the experience of gray iron foundrymen in his district in assembling a group to interchange information on costs. These costs are tabulated by an impartial accountant and then used as a basis for individual comparison by the members of the group. Sentiment was expressed in favor of a similar plan of procedure among nonferrous foundries in various sections.

Nonferrous Sessions Attract

NEARLY 100 nonferrous foundrymen attended the session on nonferrous foundry practice held Wednesday morning with G. H. Clamer, Ajax Metal Co., Philadelphia, presiding. H. J. Roast, National Bronze Co., Ltd., Montreal, Que., presented a paper dealing with some practical problems in the brass foundry. One of the points discussed was that of segregation of phosphorus which results from too high a temperature. Dendritic structure also is caused by pouring too hot. That was determined by casting metal at temperatures ranging from 2100 to 1900 degrees Fahr.

E. F. Wilson, Jefferson-Union Co., Lockport, N. Y., Read a Paper on Some Experiments in Sand Control

Another problem encountered was the making of a white metal for decorative purposes. A 50-50 solder was found excellent for the work. A combined button hook and shoe horn cast in manganese bronze, poured uphill and gated at the horn end gave poor physical tests. After some experiments, it was found that the trouble encountered was eliminated by gating at the center. Mr. Roast also explained the molding and casting of a large door having five panels. The door was 4 x 13 feet and ¼-inch thick. The mold was poured through 5 reservoir gates along the side with runners across the five panels. Metal was melted in an electric furnace and crucibles and poured at approximately 2150 degrees Fahr. His firm used a test panel about one foot square with heavy relief for testing the various mixtures possible to use, this gave information on the running qualities and the color of the metal.

In discussing the paper, G. H. Clamer, and W. M. Marr, Ohio Brass Co., Mansfield, O., agreed in many particulars with the experience of Mr. Roast. Mr. Clamer stated that on one occasion he found phosphorus segregation in an overheated bearing which gave on analysis, 22 per cent tin and 3 per cent phosphorus. The original metal was 80-10-10 alloy with phosphorus as a deoxidizer.

J. B. Meier, F. & H. Foundry Co., Newark, N. J., presented a paper on electric arc furnaces in the general jobbing brass foundry in which he gave data on operation, costs, and other items pertaining to the electric furnace. E. F. Hess, Ohio Injector Co., Wadsworth, O.; H. M. St. John, Detroit Lubricator Co., Detroit; Mr. Burley, Western Electric Co., Chicago; J. H. Cheetham, Mueller Co., Decatur, Ill., discussed the paper, referred to advantages of the electric furnace and gave a comparison of costs between that type of furnace and natural draft coke melting unit.

J. W. Bolton chairman of the nonferrous divisional committee then gave a short talk on the aims of the committee and asked all members interested to give their support. He also asked that such members send in their names to the secretary of the association so that they may be enrolled in that section.

Held Round Table

Following the session on nonferrous foundry practice on Wednesday morning at 10 o'clock, 120 members attended a round table luncheon which was followed in turn by an extremely animated discussion on shop practice. Some of the problems dealt with the best time to add phosphorus, the effect of phosphorus on the color of castings, results of using one sand for molding aluminum, brass and bronze, and the use of rubber core binders. Most of the speakers agreed that phosphorus gives the best results when added in the furnace, but in the case of low zinc alloys, crucible additions gave good results. According to some, phosphorus will spoil the color of bronze castings. Others gave an opposite opinion. The same sand should not be used for making aluminum, brass and bronze castings if pressure work is made with the latter two. Aluminum picked up by the sand will be absorbed by the brass and bronze causing leaky castings.

Rubber core binders will be found useful for certain types of work according to one speaker. However, the binder made from sheet rubber and high grade gasoline is not strong and cores must be handled carefully. Thermoprene binder gives a good core as it sets hard, but at the present time that material practically is unavailable for that work. In discussion of causes of surface porosity it was stated that trouble probably was due to improper furnace operation and pouring at too high temperature. Gaseous condition in aluminum castings was caused by heating the metal too high in the furnace according to the speakers. It should not be heated much above the pouring temperature.

Dr. Fritz Meyer, National Radiator Corp., Johnstown, Pa., Spoke on the European Development of High Test Cast Iron

Leakage in heavy sections of globe valves may be prevented by running the proper size gates to those sections. One interesting problem brought out was the elimination of defects caused by a slag like inclusion. According to several, this could be eliminated by better gating of the casting, using a type of gate that would give a skim-gate or trap effect. Others claimed that the inclusions were caused by phosphorus which segregated.

Data presented by several showed that cores for lead castings should be made with a molasses, dextrin or other water soluble binder. After drying it should be rubbed thoroughly with a paste made from oil and graphite. This is necessary to close the openings in the sand. Mention also was made of a new type of nonferrous melting unit that employs a cupola with petroleum coke as fuel.

It was stated that the cupola had to be lined every two weeks in one plant, but that a new lining composed of silicon carbide, rammed in would be tried as a remedy. It also was claimed that the melting unit had low loss, that a 500-pound charge of metal is melted in about 12 minutes with a melting cost of $2.60 a ton. Although showing best results on red metal the furnace also has been used to melt yellow brass.

Sand Sessions Hold Interest

EXTENT to which the many angles of the molding sand question appeal to foundrymen was indicated by the fact that the meeting was held in the largest of the rooms in the hotel set apart for convention sessions. The first session began at 4 p. m, and held the close attention of the members until well past 6 p. m. With several items on the program still untouched the meeting was resumed at 7:30 p. m. R. A. Bull, director of the Electric Steel Founders Research group and one of the men directly responsible for the active participation of the American Foundrymen's association in the movement to investigate foundry sands, occupied the chair at both sessions.

The afternoon session included the presentation of papers on "Sand Control in a Brass Foundry," by W. F. Graham, Ohio Brass Co., Mansfield, O.; "Sand Control in a Malleable Foundry," by W. Ranis, Union Malleable Iron Co., Moline, Ill.; "Sand Control in Gray Iron Foundries," by R. F. Harrington, Hunt-Spiller Corp., Boston; and "Reduction of Scrap", by E. W. Smith, Crane Co., Chicago. Absence of the author prevented the presentation of a paper on "Sand Control in a Steel Foundry", by H. A. Mason, Gould Coupler Co., Depew, N. Y.

At the plant of the Ohio Brass Co., Mansfield, O., the sand is handled in a manner that has become fairly well standardized in recent years. The molds are made and poured continuously on 15 floors and the sand is distributed to the various molding stations by a conveyor belt. The castings are light and therefore the sand is not burned or even dried to a great extent. The necessary amount of water is added at a certain point on the belt by a man who judges the moisture content by squeezing a quantity of the sand in his hand. The bond is renewed and the volume of the sand is maintained by the addition of six barrow loads of sand daily. This works out at the ratio of 425 pounds of new sand per ton of castings produced.

W. Ranis, Union Malleable Iron Co., Moline, Ill., claimed that the most satisfactory results have been obtained by close co-operation between the laboratory and the foremen in the shop. The laboratory, by a series of tests and careful observations, determined the ideal sand and then if necessary modified one or more points in conformity with the foremen's recommendations to meet practical operating conditions. The sand is not handled mechanically but is arranged in the familiar long heaps on the floor where each molder cuts it over twice a day. The permeability is held between 8 and 18, the moisture content between 6 and 8 and the compression test between 2 and 3 3/10 pounds. Answering a question from the floor the speaker stated that no sand is accepted unless the lime content is below 5 per cent.

R. F. Harrington, Hunt-Spiller Corp., Boston presented a report of the conservation and reclamation committee. Several firms reported gratifying results from the use of clay as a bond for old sand. He favored the use of bulletins in shops to acquaint the foremen and workmen with the results of experiments and thus raise the general knowledge of the subject among foundrymen.

E. W. Smith, Crane Co. claimed that the scrap pile is the greatest educating medium in the foundry and the study and preparation of sand should be based on this item. Report of the committee on molding sand research was presented by H. Ries, Cornell university, Ithica, N. Y., at the evening session. Other papers included "Sound Castings," by R. W. Kurtz, Jas. B. Clow & Sons, Newcomerstown, O.; "Some Experiments in Sand Control," by E. F. Wilson, Jefferson-Union Co., Lockport, N. Y., and "The Refractoriness of Foundry Sands," by J. F. McMahon, mines branch, department of mines, Ottawa, Canada.

Reviews Malleable Practice

THURSDAY morning's session on malleable iron foundry practice was attended by about 75 men. Frank J. Lanahan, Fort Pitt Malleable Iron Co., McKees Rocks, Pa., was chairman of the session. Duncan Forbes, Rockford-Northwestern Malleable Iron Co., Rockford, Ill., presented a paper on, "Practical Aspects of White Fracture Malleable Iron." He showed that this condition may be avoided by maintaining the silicon under 1.00 per cent and the phosphorus under 0.17 per cent. Melting operations should be normal and excessive annealing temperature should be avoided. Oven should be pulled at 1000 degrees Fahr., and the castings should not be reheated to 850 degrees Fahr.

Scott Mackay, University of Wisconsin, Madison, Wis., chairman of the division of malleable iron foundry practice presented a short report on the aims of the division which include making available to a greater number of people the research investigations carried on in various laboratories, a comprehensive educational program on the value and application of malleable castings, and a co-ordinated research program which will be conducted in the plants and laboratories of the interested members.

"Controlling the Atmosphere in Malleable Annealing Ovens," was the subject of a paper given by W. F. Graham, Ohio Brass Co., Mansfield, O. This paper describes the injection of products of combustion from the annealing furnace, back into the burner system to aid in the maintenance of uniform temperature during the holding period. Powdered coal was used for fuel. H. A. Schwartz, National Malleable & Steel Castings Co., Cleveland, followed Mr. Graham with a paper on shrinkage in malleable iron castings, in which he gave some data on the method employed for determining the type of shrink and some results obtained from examination of commercial heats.

D. P. Spencer, Racine Steel Castings Co., Racine, Wis.; J. T. MacKenzie, American Cast Iron Pipe Co., Birmingham, Ala.; H. W. Gillett, bureau of standards, Washington; R. E. Bryant, Jefferson Union Co., Lexington, Mass.; C. M. Seager, bureau of standards, Washington; W. R. Bean, Grindle Fuel Equipment Co., Harvey, Ill., and others discussed the papers.

At the roundtable meeting on Thursday, J. B. Deisher, A. F. A. representative on bureau of standards, malleable iron division presented a report on a meeting of the advisory committee with the bureau of standards, Washington, May 11 and 12, 1928, where the following phases of the malleable iron industry were taken up for consideration: Unstable condition of malleable cast iron under certain conditions when passing through the annealing temperature range 1000 to 700 degrees Fahr. in cooling; relationship between the physical characteristics of certain brands of pig iron and those of malleable castings made from these irons; modification of the present style and size of tensile test bar to conform with varying thickness sections; blueprints to show weights of castings; cutting down the annealing time; establishment of more definite specifications for malleable cast iron composition; some reliable means of measuring shrinkage in comparison with chemical composition, pouring temperature, pouring time, etc.

H. A. Schwartz, National Malleable & Steel Castings Co., Cleveland, and W. R. Bean, Grindle Fuel Equipment Co., Harvey, Ill., described methods and equipment recently developed by Industrial Furnace Co. and General Electric Co., for cutting down the annealing time for malleable iron castings. In the first method the cycle occupies approximately four days while in the second the period has been reduced to 24 hours.

Shortening of time in both instances is accomplished by raising the temperature rapidly at first, holding it for a definite period and then reducing it. In the first instance indicated this is done slowly, thus accounting for the four day cycle. In the General Electric method the castings are raised to a temperature of 1850 degrees Fahr. in about 12 hours, held at that temperature for 3 hours, then during a period of 6 hours the castings are reduced in temperature below the critical range. During this stage the temperature is raised three times to about 50 degrees higher and then the castings are allowed to cool. It is claimed that these three *kicks* are essential features of the process.

Explains Institute To Gray Iron Foundrymen

Nearly 100 gray iron foundrymen attending the convention of the A.F.A. in Chicago were present at the luncheon sponsored by the Gray Iron Institute Thursday noon in the Stevens hotel, Chicago.

A forceful address, presenting the story of the Gray Iron institute and its aims, was given by Arthur J. Tuscany, manager of the institute. Following the address, a number of listeners asked questions, and several expressed satisfaction with the results in time, money and research already accomplished.

Mr. Tuscany presented interesting charts to show how inattention to merchandising problems lack of standardization, research and new market possibilities, and various substitutes are affecting the use of gray iron castings. He compared the gain in the use of steel castings from 11.2 pounds per capita population to 21.9 pounds in the period 1901 to 1925, with a loss of 15 per cent, from 112 pounds per capita to 97 pounds, in the use of gray iron castings during the same period. No fundamental weakness in the castings principle exists, he declared, and the producer of castings for his own use also must have the benefits of the institute.

Analyzing the competition of stampings and welded steel construction, Mr. Tuscany pointed to misleading and actual mis-statements that have been broadcast, some under the guise of engineering group sponsorship, to the detriment of the gray iron industry.

He declared the foundryman must be alert. The foundryman has been grossly negligent as a merchandiser. For years the concern of the gray iron castings industry has been centered in production, permitting merchandising to take care of itself. That order has become entirely reversed. The consumer is king, and whoever wins him in the modern battle of the giants wins the game.

Mr. Tuscany analyzed sales promotion and huge advertising campaigns of other trade groups, and told what had been accomplished. These groups included wrought iron, fabricated steel construction, copper and brass, paint, floor and wall tile, walnut, raisin and the common brick industries.

Asserting that every major industry has had to solve similar problems, he declared that a position of economic strength already exists for the industry, and actually awaits development by the institute. The problems of over expanded production capacity limited and inelastic demand, unsatisfactory price structure, lack of discipline within the industry, and aggressive outside competition have been met and conquered by many industries. He included the shoe, street railway, ice and bolt. nut and rivet industries as among those which have suffered similarly by aggressive new competition and faulty sales methods. New marketing possibilities, such as cast iron road signs, that have been found most acceptable for New York state, were mentioned.

Various Types of Sand Control Apparatus Were Shown

NewEnglandFoundrymen Go to Worcester

The April meeting of the New England Foundrymen's association was held in Rebboli's restaurant, Worcester, Mass., April 10. This is a deviation from the regular practice of holding its meetings in Boston. A moving picture entitled, 'The Age of Speed", portraying grinding and its relation to industrial progress was presented by Norton Co., Worcester.

FoundrymenHoldMeeting

The 381st meeting of the Philadelphia Foundrymen's association was held at the Manufacturers' club, April 17. H. M. Lane, president of the H. M. Lane Co., Detroit, was the speaker of the evening.

Titgen-Eastwood Co. has removed its offices and plant from Luzerne and D streets to 3562 North Salmon street, Philadelphia where larger manufacturing facilities are provided.

Industry Sees New Methods

THE annual exhibition of foundry equipment and supplies, held at the Stevens hotel, Chicago, April 8 to 11, in conjunction with the convention of the American Foundrymen's association, was a decided success from every standpoint. Exhibitors were pleased with the great amount of attention paid the various displays by approximately 3500 leaders on the industry who were present at some time during the four day meeting. Numerous orders for equipment were placed and many live prospects developed for sales in the near future.

Conditions under which the exhibition was held resulted in an entirely new type of show. Sufficient space was not available for the large working exhibits of bulky equipment, which have added color to many of the exhibits in recent years. Exhibitors of that type of equipment successfully presented information on their product with small units, models, drawings and photographs. However, the booths of manufacturers of small equipment and various types of supplies had much the appearance of those maintained at former shows. The exhibition was representative of progress made in the industry.

The compactness of the exhibition and the fact that all convention activities were centered in one building, were important factors in the success of the show. Convention visitors were able to inspect practically all of the exhibits, and attend the technical sessions related to the branch of the industry in which they are interested, without undue effort. Undoubtedly, the compactness of the exhibit resulted in closer contact and a better understanding between foundryman and exhibitor of supplies and equipment.

Exhibit Shows Mechanical Trends

MACHINERY designed to solve practically every material handling problem in the foundry industry was one of the interesting features of the exhibition. Trucks, cranes, hoists, monorails, conveyors, buckets, pouring devices and numerous other types of handling equipment were on display at various booths in the exhibition hall. The Northern Engineering Works, Detroit, showed a low head, 5-ton crane trolley and a 1-ton hoist mounted on a structural steel runway. A similar hoist, designed for high lifts, was supported on a stand to permit close inspection.

American Engineering Co., Philadelphia, operated a 2-ton electrically-driven hoist on an overhead beam. A second unit of similar design was displayed from the floor. A 1-ton, single I-beam, electric hoist was featured by Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y. Photographs and drawings of other material handling equipment also were shown by the company. Milwaukee Electric Crane & Hoist Co., Milwaukee, displayed a roller-bearing, crane trolley of a type suitable for foundry installation.

An electrically-operated pouring device and several types of hoists and trolleys were operated on monorail equipment by Louden Machinery Co.,

Fairfield, Ia. Yale & Towne Mfg. Co., Stamford, Conn., exhibited an industrial lift truck, a 1-ton, power-driven trolley type crane, a ¼-ton electric hoist, a 1-ton spur geared chain block, a similar block of the screw gear type, and several units with parts cut away to show the important construction features. Modern Pouring Device Co., Port Washington, Wis., operated a new type of electric pouring device and hand-operated pouring equipment on a rather extensive monorail system. Numerous types of chain and electric hoists featured the display of Chisholm-Moore Hoist Corp., Tonawanda, N. Y.

Several sections of standard-heavy and extra-heavy duty roller conveyors for handling molds, castings and other foundry materials, were exhibited by Mathews Conveyor Co., Ellwood City, Pa. Clark Tructractor Co., Battle Creek, Mich., operated a 3-ton lift truck and an industrial truck for picking up and handling bulk materials. Storage battery trucks of the low and high-lift types, were shown in operation by Automatic Transportation Co. Inc., Buffalo. Blaw-Knox Co., Pittsburgh, featured a clam shell bucket and small samples of a steel grating especially applicable to industrial use. Buckets also were shown by Hayward Co., New York, and G. H. William Co., Erie, Pa.

Show Sand Equipment

Several displays were devoted to mold and sand handling systems. C. O. Bartlett & Snow Co., Cleveland, exhibited sections of a mold conveyor, apron conveyor, belt conveyor idlers as well as illustrations of installations. Photographs of foundry handling installations were shown by Chain Belt Co., Milwaukee, R. W. McIlvaine Co., Chicago, and Link-Belt Co., Chicago. The latter company also exhibited a vibrating screen for foundry sand, a speed reducer and samples of various types of chains.

Cleaning room equipment of various types created considerable interest at the show. Pangborn Corp., had an artistic booth arranged with large colored photographs of the barrel type and table type sandblast units for a background. The company also showed a 4-screen dust arrester section and a sandblast helmet. New Haven Sand Blast Co., New Haven, Conn., showed a small pressure sandblast barrel and dust arrester equipment. A complete machine for sandblasting and tumbling castings was featured by American Foundry Equipment Co., Mishawaka, Ind. That company also displayed a tapered slip flask, pouring jackets and other equipment. W. W. Sly Mfg. Co., Cleveland, exhibited photographs, drawings and equipment showing installations of various types of foundry machines including sandblast and dust arrester equipment sand reclaiming units, etc. A completely equipped sandblast machine, a small sandblast barrel and a model dust arrester were exhibited by MacLeod Co., Cincinnati.

Manufacturers of grinding equipment were well represented. A variety of grinding wheels were shown by Carborundum Co., Niagara Falls, N. Y. Kling Bros. Engineering Works, Chicago, operated several floor type grinders equipped with rubber bonded wheels made by Manhattan Rubber Co., Passaic, N. J. Norton Co., Worcester, Mass., showed

Practically All Types of Foundry Equipment Were On Display at the Various Booths of the Exhibit

various types of grinding wheels and a floor type grinding stand designed for high speed grinding. Six large direct motor-driven grinders were shown by United States Electrical Tool Co., Cincinnati.

Operate Grinding Machines

Special high speed grinding wheels and a variety of smaller wheels for snagging castings were displayed by the Abrasive Co., Philadelphia. Photographs showed high speed wheels in operation. The Safety Grinding Wheel Co., Springfield, O., exhibited a large floor type grinding machine and specially bonded wheels for high speed grinding. A high speed floor type grinder and a swing frame grinder were operated by the Marschke Mfg. Co., Towson, Md. That company also showed an 18-inch grinder. Portable pneumatic tools were shown by Dayton Pneumatic Tool Co., Dayton, O. These included chippers, riveters, sand and bench rammers, etc. Buckeye Portable Tool Co., Dayton, O., exhibited a line of portable pneumatic grinders and other tools.

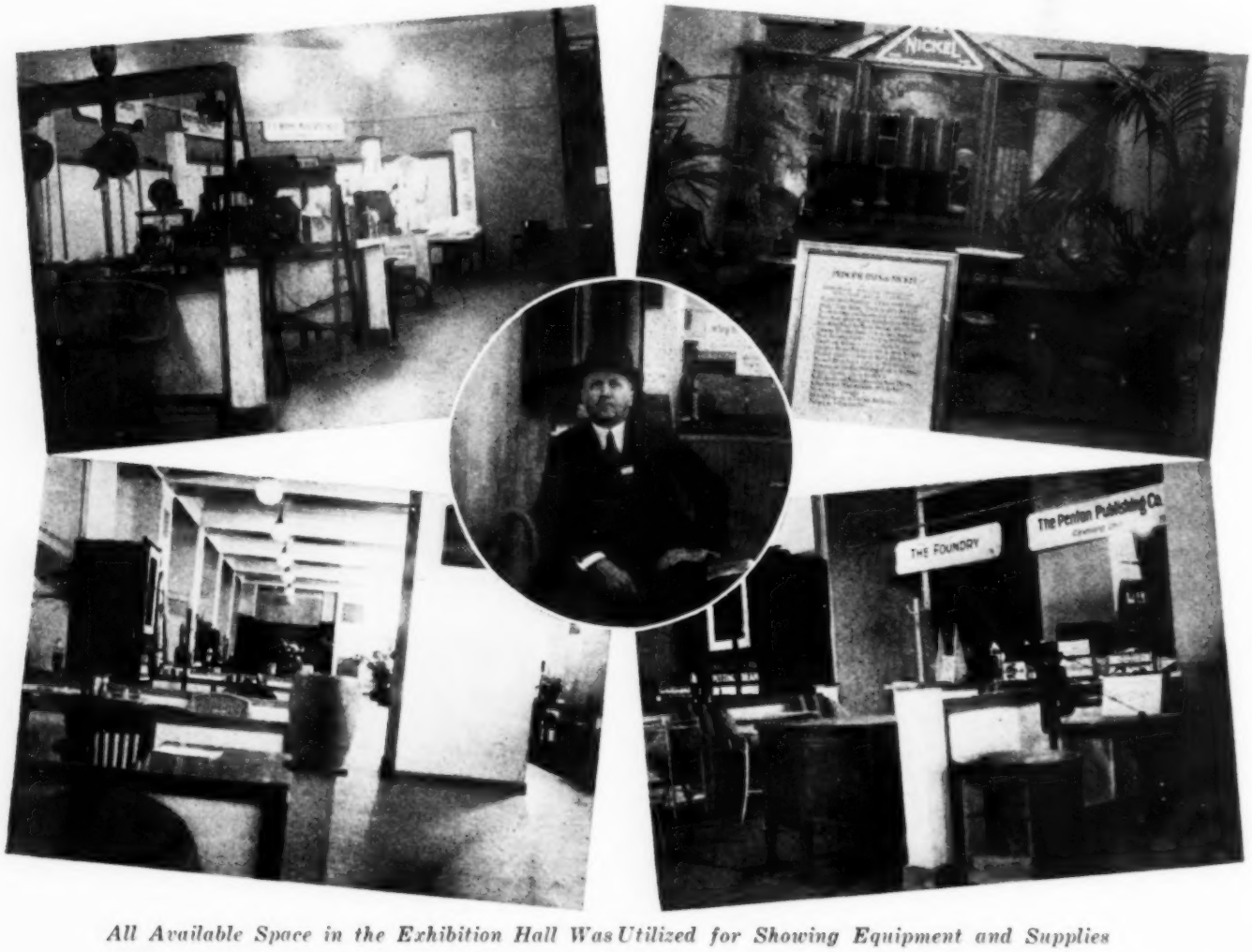
Speed reducers were shown by W. A. Jones Foundry & Machine Co., Chicago. One of the units was cut away to show the construction of the reducer. A new type of tumbling barrel was shown by Whiting Corp., Harvey, Ill. The barrel was driven by an electric motor through a reducer made by W. A. Jones Co.

The importance of proper sand preparation in modern foundry operations resulted in considerable attention being paid to sand mixing and preparing equipment. Royer Foundry & Machine Co., Wilkes-Barre, Pa., exhibited three models of its line of sand separating and blending machines. These included two portable type machines with capacities of 300 and 500 pounds per minute, and a new type of machine designed for continuous systems with a capacity of 60 tons per hour. Deister Concentrator Co., Ft. Wayne, Ind., operated a foundry residue reclamation plant for brass foundries and showed a special type of foundry screen. National Engineering Co., Chicago, showed a laboratory size muller type mixer and photographs of installations. A sand throwing machine for blending and mixing foundry sand was featured by Axmann Sand-Throwing Machine Co., Cleveland. Great Western Mfg. Co., Leavenworth, Kans., displayed two gyratory type foundry sand riddles, one large and one small size, and a laboratory riddle for determining the fineness of foundry sand. Lowe Mfg. Co., Detroit, operated an electrically-driven sand sifting machine.

Feature Molding Machines

Several new developments in molding machines were shown for the first time. These included a shockless jar ram, squeezer type, molding machine with a flask lifting device exhibited by Tabor Mfg. Co., Philadelphia. This machine has a heavy steel column to support the squeezer head and prevent springing. A departure from usual practice is the employment of heat-treated aluminum castings for the supports on the jarring mechanism. The firm also showed a core blowing machine, a hand-ram, rollover core machine with an automatic leveling clamp and pattern draw, and a post type, jar-vibrator, portable molding machine.

Herman Pneumatic Machine Co., Pittsburgh, exhibited a new ½-ton capacity, jar-rollover and pattern drawing machine. In this machine the platen extends out from the ma-



All Available Space in the Exhibition Hall Was Utilized for Showing Equipment and Supplies

While the Booths Were Small, A Large Amount of Equipment Was Shown by the Many Exhibitors

chine and the rollover mechanism is reversed as compared to the older type machines. Another feature is an automatic greasing arrangement that lubricates the moving parts. A smaller jar stripping-plate molding machine also was shown.

Stationary and portable jolt squeeze molding machines, and other molding equipment such as snap flasks, slip flasks and steel jackets were exhibited by the Adams Co., Dubuque, Ia. Wadsworth Core Machine & Equipment Co., Akron, O., featured steel reinforced core and bottom plates, equipment for a special method known as drag plate molding, and sand and core testing equipment. A core blowing machine with a number of cores produced on that type of machine were shown by Wm. Demmler & Bros., Kewanee, Ill.

Many Machines Displayed

Several different types of molding machines were displayed by Wm. H. Nicholls Co. Inc., Richmond Hill, L. I., N. Y. These included portable jolt squeezers, with and without pattern draw, and a large jolt squeeze, rollover machine with pattern draw. Roller equipment attached to the machine allows movement of the heavy flasks from the machine without lifting. Osborn Mfg. Co., Cleveland, exhibited a jolt squeeze, rollover, pattern drawing molding machine, a jolt, squeeze machine, and a core machine. The rollover molding machine was equipped with roller conveyors to transport the flasks to and from the machine. All machines had patterns and core boxes to make dummy molds.

Arcade Mfg. Co., Freeport, Ill., showed a heavy duty, portable type molding machine, a jolt rollover core machine, and a jolt squeezer machine. Molding and core making machines were featured by International Molding Machine Co., Chicago. Moline Iron Works, Moline, Ill., displayed a squeezer type molding machine, and the exhibit of Beardsley & Piper Co., Chicago, consisted of photographs of sand slinging machines which have been installed in various foundries.

Core ovens and core oven equipment were displayed by a number of firms. These included Swartwout Co., Cleveland, which showed a gas-fired oven; Young Bros. Co., Detroit, which exhibited an electrically heated oven, and Paul Maehler Co., Chicago, which displayed gas fired, core oven heaters and temperature control equipment. Foundry Equipment Co., Cleveland, showed photographs of core and mold oven installations including the rolling drawer, portable rack, car and conveyor types.

Cupola blowing apparatus was displayed by the Spencer Turbine Co., Hartford, Conn. That exhibit included a 20-horsepower turbine blower for cupolas and a 3-horsepower turbine blower for supplying air for oil and gas burners, and other industrial heating equipment. General Electric Co., Schenectady, N. Y., showed its cupola blowing apparatus including a centrifugal blower equipped with an automatic device to insure a constant weight of air delivered to the cupola.

Melting equipment and refractories were shown by several companies. Detroit Electric Furnace Co., Detroit, had in operation a 100-kilowatt electric furnace under a dummy load. Ajax Electrothermic Co., Trenton, N. J., exhibited a wooden model of its 300-pound coreless induction furnace for melting steel and nonferrous metals. Photographs of electric furnace installations with castings made from metal melted in its furnace featured the display of Pittsburgh Electric Furnace Co., Pittsburgh. Refractories made of graphite such as crucibles, nonferrous furnace lining materials, nozzles, plastics, etc., were shown by Lava Crucible Co. of Pittsburgh, and Joseph Dixon Crucible Co., Jersey City, N. J. Whiting Corp., Harvey, Ill., featured a unit type coal pulverizer for industrial furnace use and photographs of miscellaneous foundry equipment. Drawings of equipment also were shown.

Welding Apparatus

Linde Air Products Co., New York, and Air Reduction Sales Co., New York, exhibited tanks of oxygen and acetylene, carbide, carbide lamps, and apparatus for cutting and welding. Instruments for determining temperatures and sand testing were displayed by Pyrometer Instrument Co., New York; Illinois Testing Laboratories Inc., Chicago, and Harry W. Dietert, Detroit. International Nickel Co., New York, exhibited a painting showing the application of nickel to steel, gray iron and brass. The firm also displayed a cross section of an automobile cylinder block made from nickel cast iron. Typical fractures of pig iron and castings made from mixtures containing a natural, chromium-nickel bearing pig iron were shown by the Bethlehem Steel Co., Bethlehem, Pa.

Brass, bronze, aluminum and aluminum alloy ingots, shot and castings were shown by Ajax Metal Co., Philadelphia; British Aluminum Co., Ltd., New York, and Alloys & Products, Inc., Bronx, N. Y. Foundry coke was featured by Semet-Solvay Co., New York, and Indiana Consumers Gas & By-products Co., Terre Haute, Ind. Federal Foundry Supply Co., Cleveland, displayed core binders and other foundry supplies and its sand testing equipment for use in the laboratory.

Vent waxes and cores showing their uses were shown in exhibits of American Vent Wax Co., Lockport, N. Y., and United Compound Co., Buffalo. Pattern wax also was shown. Graphite, plumbago, core washes and other graphite products were shown by United States Graphite Co., Saginaw, Mich.

Nearly a dozen companies displayed an interesting variety of core binders, including linseed oil, linseed oil base, dry binders and compounds. These exhibits included specimen cores, plain, intricate and heavy type, and a number of finished castings in which cores made from these products were used. Among those exhibitors were Spencer Kellogg & Sons Sales Corp., Buffalo; Werner G. Smith Co., Cleveland; Lindsay-McMillan Co., Milwaukee; Knefler-Bates Co., Indianapolis; Corn Products Refining Co., New York; Advance Milling Co., Chicago; Smith Oil & Refining Co., Rockford, Ill., and Pennsylvania Lubricating Co., Pittsburgh.

Various types of sand for ferrous and nonferrous molding and core use, for rebonding molding sands, and also sandblast sands, fire clay, and silica wash were shown by a number of companies including Illinois Clay Products Co., Joliet, Ill.; Mt. Jewett Fire Clay Co., Mt. Jewett, Pa.; Albany Sand & Supply Co., Albany, N. Y.; Standard Silica Co., Chicago; Eastern Clay Products Co., Buffalo, Ayres Mineral Co., Zanesville, O., and Industrial Minerals Co., Columbus, O., the latter company also showing steel abrasives.

Foundry supply exhibits were well diversified. Moltrup Steel Products Co., Beaver Falls, Pa., showed new bottom boards and squeezer plates and solid and perforated polished core plates. S. Obermayer Co., Chicago, exhibited snap flasks, jackets and other foundry supplies. Malleable Iron Fittings Co., Branford, Conn., had on display a new model flask rapper in its exhibit of foundry vibrators. Diamond Clamp & Flask Co., Richmond, Ind., demonstrated a number of snap flask fittings and also showed wood snap flasks, steel jackets, steel bands, steel bottom plates, steel core plates, wood wedges and wood core boxes. Supplies also were shown by Sterling Wheelbarrow Co., Milwaukee; Truscon Steel Co., Youngstown, O.; and H. L. Baumgardner Corp., Chicago. Safety equipment comprised an interesting feature of the exhibit. Rohrbacher Shoe Co., Boston, and Safety First Shoe Co., Framingham, Mass., had complete lines of safety shoes and Safety Clothing Co., Cleveland, exhibited safety clothing made from asbestos, leather and fire proof duck, as well as safety guards for various types of machines, respirators and sandblast helmets.

The design and layout of the modern foundry plant was given attention at the exhibition with displays by the Austin Co., Cleveland, and Frank D. Chase, Inc., Chicago. The latter showed plans and layouts of both new and remodeled foundries. Austin Co.'s exhibit included photographs, plans and specifications.

Globe Steel Abrasive Co., Mansfield, O., showed samples of cornered steel grit and chilled shot with castings specimens cleaned with those materials. Charles C. Kawin Co., Chicago, gave out information regarding its foundry service and analysis work.

The entire exhibition was directly under the supervision of C. E. Hoyt, executive secretary of the A. F. A. Fred C. Balthaser, Chicago, was superintendent of installation. Mr. Balthaser has been connected with the A. F. A. exhibits for several years. Mr. A. C. Hess was traffic manager.

Pittsburgh Foundrymen Nominate Officers

The following officers for 1929 were nominated at a meeting of the Pittsburgh Foundrymen's association at the Fort Pitt hotel April 15: President, L. W. Mesta, Mesta Machine Co., Homestead, Pa.; vice president, W. E. Troutman, Duquesne Steel Foundry Co., Coraopolis, Pa.; secretary-treasurer, W. J. Brant, Bessemer building, Pittsburgh. Executive committee nominees were named as follows: C. D. Carey, American Steel Foundries, Verona, Pa.; L. V. Stephens, Marine Mfg. Supply Co., Pittsburgh; R. M. Cook, Eclipse Pattern Co., Pittsburgh; S. C. Daniels, Mackintosh-Hemphill Co., Pittsburgh; H. O. Seifert, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Action on the nominations will be taken at the May 20 meeting of the association.

Edward E. Marbaker, director foundry research division Whiting Corp., Harvey, Ill. and Pittsburgh, was the speaker of the evening. He presented a paper on "The Operation of The Foundry Cupola." The annual stag picnic of the association will be held Monday, June 17, at Turner park, Perrysville, Pa.

Material Handling Equipment Featured a Large Number of the Booths at the Exhibition

S. T. Johnston *H. S. Falk* *Arnold Lenz* *Delos H. Wray* *F. J. Lanahan*

A. F. A. Elects Directors

ANNOUNCEMENT of the election of five members to the board of directors of the American Foundrymen's association was made at the annual business session, Monday, April 8. Those elected are as follows: S. T. Johnston, vice president, S. Obermayer Co. and the National Engineering Co., Chicago; H. S. Falk, vice president and general manager, Falk Corp., Milwaukee; F. J. Lanahan, vice president, Fort Pitt Malleable Iron Co., McKees Rocks, Pa.; Arnold Lenz, manager, Chevrolet Motor Co., Gray Iron Foundry, Saginaw, Mich.; and Delos H. Wray, vice president, Henry Wray & Son, Rochester, N. Y. According to the constitution, the president, vice president and directors will take office at the annual meeting of the board of directors, which must be held within 90 days after the close of the convention.

Arnold Lenz

Arnold Lenz, one of the new members of the board of directors, is manager of Chevrolet Motor Co., Saginaw, Mich. Mr. Lenz was born May 10, 1888, at Hauingen, Germany and came to the United States when 14 years of age. He attended New York State Normal school for two terms. In 1908, he accepted his first position with the Browning Foundry Co., Ravenna, O. Since that time he has served in various capacities with the Alliance Brass & Bronze Co., Alliance, O., Ryder Brass Foundry Co., Bucyrus, O., American Clay Machinery Co., Bucyrus, O., and the American Range & Foundry Co., Cleveland. In May 1916, he secured a position with the Buick Motor Co., Flint, Mich., where he rose to assistant foundry superintendent in the same year. In January, 1919, he accepted a position as assistant to the manager of the Aluminum Casting Co., Detroit, but returned to the General Motors Corp., the following May as superintendent of the gray iron foundry of the Saginaw Products Co., Saginaw, Mich., then under construction. In 1922 he became manager of that plant and in June 1925 he was promoted to assistant to the general manager of the Saginaw Products Co., in charge of gray iron and malleable iron foundries.

H. S. Falk

Harold S. Falk, elected to the board of directors, is vice president and works manager, Falk Corp., Milwaukee. He was graduated from the University of Wisconsin, school of engineering, in 1906. Mr. Falk spent his vacations, from 1901 until his graduation from college in the various departments of the Falk Corp. When he had completed his university training, he was employed by the Falk Corp. in the maintenance department. Later he was made assistant to the foundry superintendent, in which capacity he served for several years. He then was promoted to assistant foundry superintendent and later to superintendent of the entire plant in which capacity he served until 1922 when he was made vice president and works manager.

S. T. Johnston

Samuel T. Johnston, elected a director of the association, is past president and one of the charter members of the organization, He was born and educated in Scotland and came to America when a young man. His first position was under J. H. Whiting who at that time was general superintendent of Detroit Car Wheel Co., Detroit. When Mr. Whiting organized the Detroit Foundry Equipment Co., Mr. Johnston joined the company as a salesman. Later he became connected with S. Obermayer Co., Chicago, where he now is vice president and general manager. He also is vice president of the National Engineering Co., Chicago. Mr. Johnston has been active in the A. F. A. having served as president, vice president and director. He was one of the signers of the application for the charter when the association was incorporated, and has attended every convention since the association was organized. When the Foundry Supply association was organized in 1906 to handle the exhibits at the annual conventions he was elected the first president. He also served as president of the Foundry Equipment Manufacturers' association which was organized in 1919.

D. H. Wray

Delos Hollowell Wray, elected a director for the three year period, was born Dec. 8, 1881, at Rochester, N. Y. He was educated in the local schools, Mechanics institute and Phillips academy, Andover, Mass. He completed his education in 1904 and since that time has been associated in various capacities with Economy Cream Separator Co., National Brass Mfg. Co., and Henry Wray & Son, Inc., all of Rochester. N. Y.

F. J. Lanahan

Frank J. Lanahan, one of the newly elected directors of the American Foundrymen's association, is president of the Ft. Pitt Malleable Iron Co., McKees Rocks, Pa. Mr. Lanahan also is a director of Carnegie Institute of Technology, Pittsburgh.

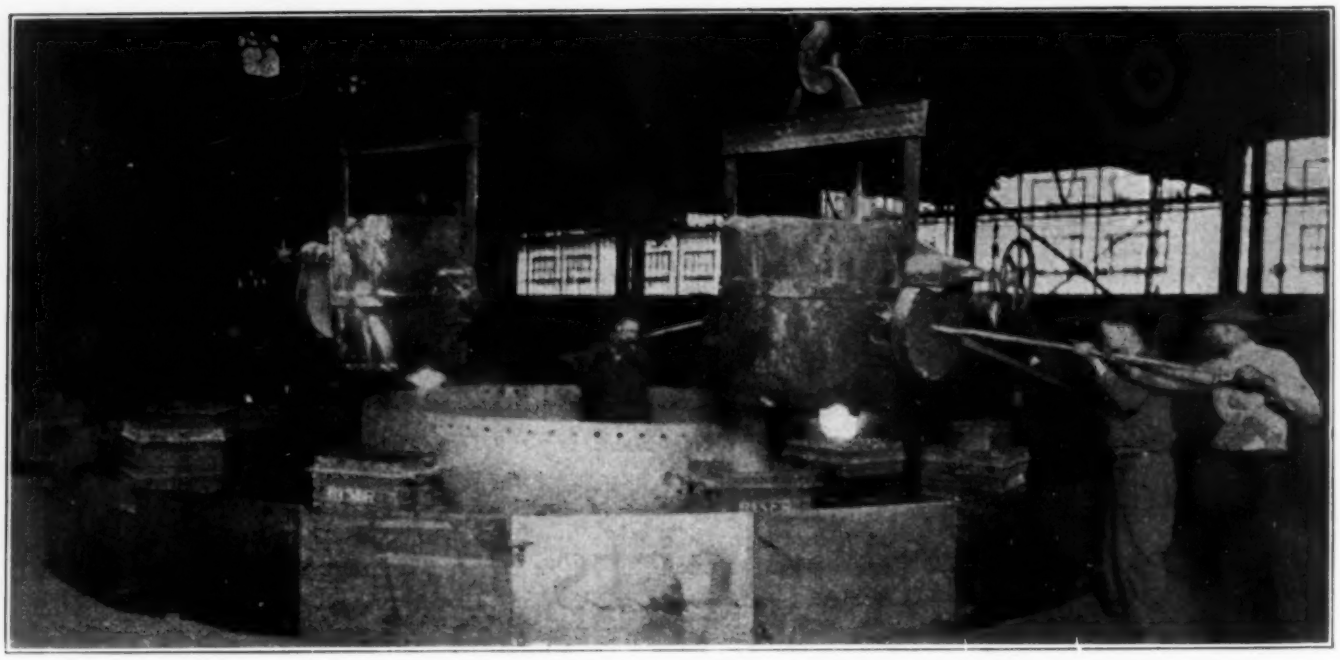


Fig. 1—Two ladles were employed to pour the ring casting from opposite sides

Hold Steel Ring To True Circle

By Commander F. G. Crisp

A 23-FOOT diameter one-piece steel ring of constantly changing section and weighing approximately 9000 pounds in the rough may seem an easy steel casting to make, but experience to date has shown the Norfolk navy yard and one other steel foundry that it is about the most difficult ever attempted particularly when the job is tackled with nothing approximately similar having been attempted in the past.

We quickly found that 9000 pounds of steel spread out in a 72-foot circular section ranging constantly from an unequal flange channel shape with bosses between flanges to an irregular flat shape section, does not provide the most rigid body of metal in the world or the easiest casting, particularly when it is necessary to anneal at 1650 degrees Fahr. It must remain round to a tolerance of only about ½-inch in diameter, with a similar limitation on the maximum and minimum wall thickness. A deck ring casting for one of the turrets of our new 10,000-ton cruisers, has sheer and camber to fit these well-sheered and cambered decks. The casting must present neither cracks nor flaws of any description and must meet the navy department's specifications for its best grade of cast steel—class F.

Difficulties overcome and the experience gained on a total of six rings of three different types, are of sufficient interest to justify recital in considerable detail. Methods of making patterns, molding and heat treating differ to some extent from standard practice.

With the small tolerances allowed for finish and the narrow limits for machining, two things were essential

Navy Yard Job

INTERESTING detail is presented of the many and peculiar difficulties which appeared and were overcome in the production of large deck ring castings for the new 10,000-ton cruisers. The castings were the most difficult ever attempted at the Norfolk navy yard foundry, not from pattern making and molding features, but from the necessity of meeting rigid specifications and dimensions. The author, F. G. Crisp, commander (construction corps) United States navy, is shop superintendent, Norfolk navy yard, Portsmouth, Va.

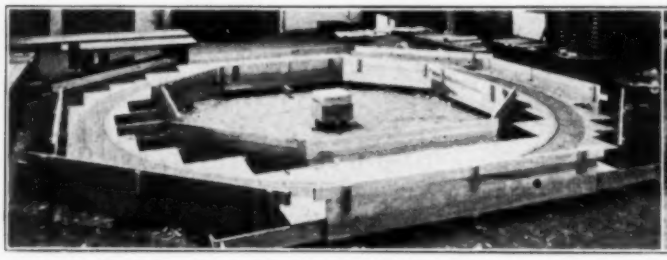


FIG. 2—FOUNDATION FOR PATTERN WAS CAMBERED AND SHEERED TO CONFORM TO THE SHAPE OF THE DECK. FIG. 3—ASSEMBLED SECTIONAL PATTERN FOR MAKING THE CORES

besides the production of an absolutely sound casting meeting all specification requirements as to physical properties, defects, etc. The first was the determination of the exact shrinkage to be expected in a casting of this shape and size and second to produce a casting as nearly circular as possible, so that machining would be practicable.

We could get a good line on the exact shrinkage by making one casting, but we did not want to make a casting which was even 2 inches smaller or larger in circumference than required because it could not be machined even with this small amount of change in circumference. However, this is exactly what happened. The first casting lacking 2 inches of being the required circumference could not be brought to the required circumference and diameter by any practicable means. It was a perfect casting in every respect and it seemed a shame to scrap it. Shrinkage of $\frac{5}{32}$-inch allowed on this first casting was not sufficient. We then allowed $\frac{7}{16}$-inch and the circumference was relatively perfect. The first casting served a useful purpose. It was used for experiments in the annealing furnace, and showed us how to overcome a difficulty that could not be prevented in the casting as cast.

The second apparently essential requirement, as stated, was to produce a casting prior to annealing as near a true circle as possible, within our limit of ½-inch. We soon found that it cannot be done. Not with a 23-foot diameter ring with this peculiar cross section.

Consideration first was given to the type of pattern construction best adopted to this job. Good pattern equipment not only would reduce the cost of molding, but would insure the best casting. We decided to make the casting entirely in cores.

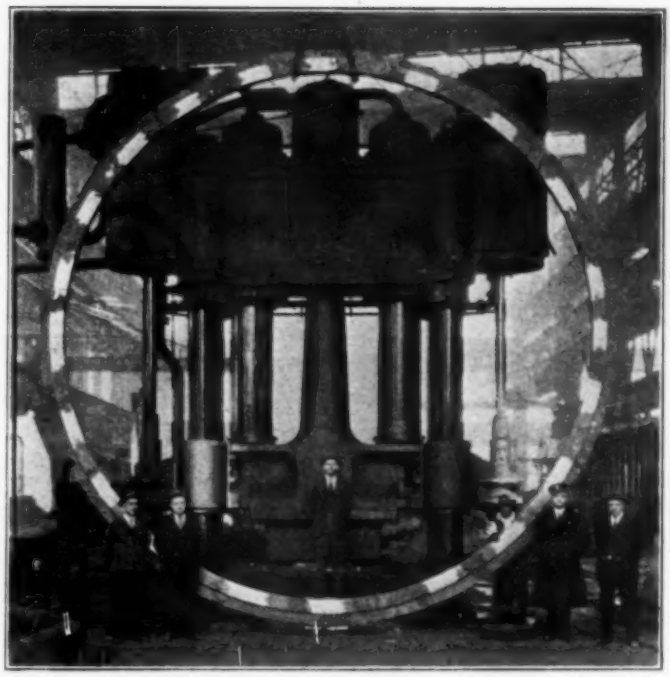


FIG. 4—FINISHED CASTING AFTER ANNEAL LAID OFF FOR MACHINING AND SLUNG BY CRANE IN FRONT OF 2000-TON FORGING PRESS

The foundation which conforms to the camber and sheer of the deck at the location for the ring is shown in Fig. 2. The sectional pattern used for making the cores is shown in Fig. 3. This does not show the bosses between flanges which are fitted to certain of the side cores. They are shown with all the coreboxes, bottom, side and top in Fig. 10. Typical cores at gate are shown in Fig. 13.

These illustrations give a good idea of the entire pattern construction which proved entirely satisfactory. The fact that 82 different coreboxes were required is sufficient to indicate the magnitude of the pattern job. All work was performed with the greatest care to insure accuracy of sections and dimensions. Since only two castings were required of each type ring, the construction was not of a permanent nature.

A substantial loam base was swept and dried at a suitable location in the foundry floor. Metal plates about 18 inches wide were laid. They extended beyond the mold for about 6 inches on either side and were slotted at each end for anchor bolts connected to similar plates on top of the mold. These can be seen in Fig. 7, a view of the finished mold. Foundation cores were leveled on these plates. The base cores for the mold were placed on these cores and the side cores were built up from this base. All coreboxes were numbered to facilitate setting of cores. Special cores were used to mark center line of casting, for test bars, placed on the outer end of upper flange and for gates and risers. A template and sweep were used to set cores correctly to an exact circle.

This method was used on the first casting until it was found that the casting would not shrink of its own accord to a true circle. Excellent views of the setup with top and side cores removed may be obtained from the two illustrations, Figs. 5 and 6. Oil sand cores were used throughout with excellent results. It will be noted in Figs. 1, 7 and 8 that the casting is gated in two places on opposite diameters at the points of maximum and minimum cross section area. The facilities of the foundry do not lend themselves well for pouring from two ladles at the same time, but this was considered essential in view of the long run of the metal. The excellent results obtained with the soundness and appearance of the castings fully justified this method even at the slightly higher cost.

Method of building is shown in Figs. 5, 6, 7. The casting immediately after removing the cores is shown in Fig. 8. Although there is nothing unusual about this set up, it may be noted that great care was exercised in setting up the cores to keep them in alignment and to have as small clearances as possible between adjacent cores, to reduce fins and runs. In Fig. 1 the cores are shown en-

FIG. 5—MOLD SET UP WITH INSIDE CORES REMOVED. FIG. 6—AT THIS STAGE ALL THE CORES FOR THE MOLD WERE ASSEMBLED WITH THE EXCEPTION OF THE COVER CORES

Fig. 7 (Left)—Mold ready for pouring. Fig. 8 (Below)—Casting with cores stripped away

closed on both sides with sand, rammed about the outer wall and fairly loose inside, when the casting is poured.

The inner wall of sand was released immediately after casting and bolts holding cores eased that there might be nothing to prevent the casting from shrinking. When it is realized that the total shrinkage amounts to approximately 13 inches in the circumference of the ring, the reason for this is apparent.

Ten risers were spaced equally about the circumference. These were large and were considered of great importance at the points farthest from the gates. The risers weigh approximately 500 pounds each. The top flange of the ring was cast down because this flange is level. The other flange, with camber and sheer of the deck, could not be swept up.

Elaborate precautions were taken to insure a true circle on the first casting, but the results were poor. After removal from the mold, it was found 2½ inches out of round, so much so that machining in this condition was out of the question. The heavy opposite sections had held and the small section had given way. It was felt that this condition might be corrected in the annealing, since undoubtedly strains had been set up by this unequal contraction in the mold. Annealing without control of the ring caused it to go out of round even more so than when cast. The trial seemed to indicate that subsequent annealing might even close the ring on the long diameter.

Since in the first casting the diameter of the small section area had given way and had become the short diameter, it was decided to cast the next ring out of round with the long diameter through the small section in the hope that in shrinking the section would be given additional resistance sufficient to overcome the stronger pull of the heavy section. The second ring was cast in that manner, but the results were worse, for the long diameter, purposely made, held and became much longer in the cooling. Obviously on account of the changing section of the ring there was no practicable way to provide for equal contraction so that a circular casting could be obtained. Castings from the mold out of round must be accepted and made round in some other manner.

It was here that the first casting, cast with insufficient allowance for shrinkage and which could not be used, was valuable. In fact use of this casting for experiments in the annealing furnace without regard to the effect on the metal, resulted in the development of a method of attaining the goal of a true circle—within the allowance.

No annealing furnace in the yard was of sufficient size to take a ring with an outside diameter of 23 feet. Reports of trouble experienced in the annealing of similar castings in rectangular furnaces with resulting unequal heating spaces outside of the casting made it appear undesirable to use such a furnace in any event.

The two wall circular furnace, Figs. 11 and 12, were designed and erected. Scrap and obsolete fire brick and locating this furnace in a space adjacent to oil and air lines and temperature recording apparatus permitted construction at a cost of less than $300. Since a special annealing furnace was required, it was decided to make it suit the castings to be annealed. The outer diameter of the inside wall and the inner diameter of outside wall were made 6 inches less and greater respectively than the inside and outside diameters of the rings. The combustion chamber was in the lower part of the furnace. The casting was supported on radial bars 4 inches square, spaced

FIG. 9—CASTING ON THE BORING MILL FOR THE PRELIMINARY CUT

about 2 feet apart in the lower part of the upper half of the furnace. Ten oil burners, equally spaced, were installed tangentially in the lower part of the furnace and arranged to prevent any direct impingement of the flame on the casting. Six equally spaced thermo-couples were installed around the upper part. These were portable and placed in contact with the casting after it has been located in the furnace. Portable plates, covered with sand formed the top of the furnace.

FIG. 10—COREBOXES NECESSARY FOR THE PRODUCTION OF ONE CASTING

Construction of this furnace provides for equal space all around the combustion and heating chambers. Operations of the furnace have been perfect. The temperatures all over the furnace have been equal and have been controlled quickly and easily. Physical tests after anneal have been consistent and highly satisfactory.

In the first attempt to convert the first casting into a true circle the short diameter was jacked out with the casting at the annealing temperature of 1650 degrees Fahr. That worked fine. It was easy to get this diameter exactly right and keep it fairly constant while the casting cooled. Measuring the casting after it had cooled completely showed that the short diameter had become the long.

The next attempt was to use a jack on four points instead of two. Setting the shape under these conditions was easy also, but the ring flattened out, between these points and was just as much out of round as before. The long and short diameters had shifted to the points on which no jacks were used.

The device shown in the center of the furnace, Fig. 12, therefore was developed. It consists of a center eight-sided cast-iron hub, centered and mounted on heavy cross timbers. Eight bars with the ends cut square, form the spokes and bear evenly against the inner wall of the casting through openings cut through the inner wall of the furnace. These bars are held in place by guides, as shown, fastened to timbers on which the hub is mounted. Locking caps are fitted to these guides and prevent bars moving up where heavy pressure is required to set the casting. A metal cap is fitted on the inner end of each bar. Accurate dimensions of the inner diameters of the casting are laid off on this cap and serve to guide the operator throughout the cooling of the ring. Wood wedge pieces, graduated to eighth-inches are fitted between the metal caps on the inner ends of the bars and the eight sides of the center hub.

The casting is brought to the annealing temperature, 1650 degrees Fahr. and allowed to soak the required time, usually two hours, depending on the characteristics of the metal. The eight bars which have been carefully placed are set up hand-tight with the wedges. A check of the diameter at four points is made. The wedges are left just tight on the longest diameter, but each short diameter is brought into agreement with the longer by driving the graduated wood wedge behind each bar with a hammer. The shape of casting at this temperature is controlled easily and no great effort is required to set the casting to a true circle.

As the casting shrinks on cooling, the wedges are eased. Where greater contraction shows on any diameter, the wedges are held tight until the contraction on other diameters is equal, then all wedges are eased together. Control of the shape is maintained as long as practicable during cooling. The furnace is kept closed during the entire time to prevent unequal cooling.

Of course it is not practicable to control the shape after the temperature has passed below 1000 degrees

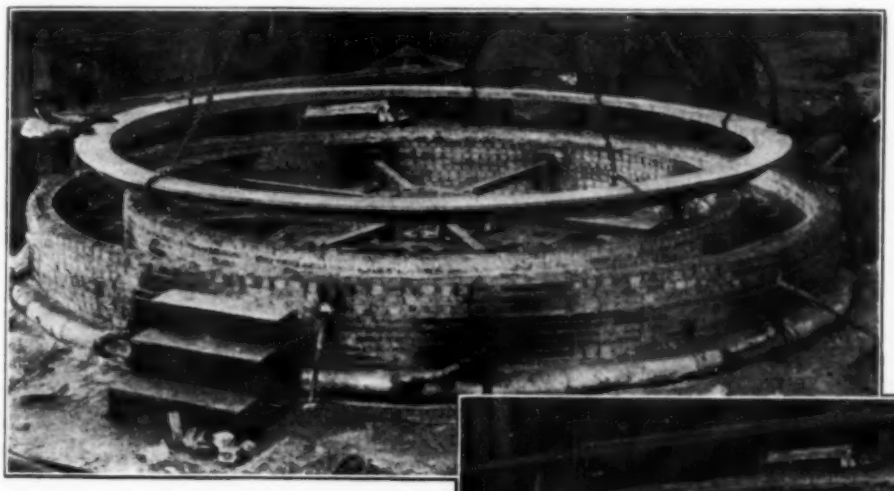


Fig. 11 (Above)—Lowering casting into the special annealing furnace. Fig. 12 (Right)—A special device in the center was utilized to regulate the contraction

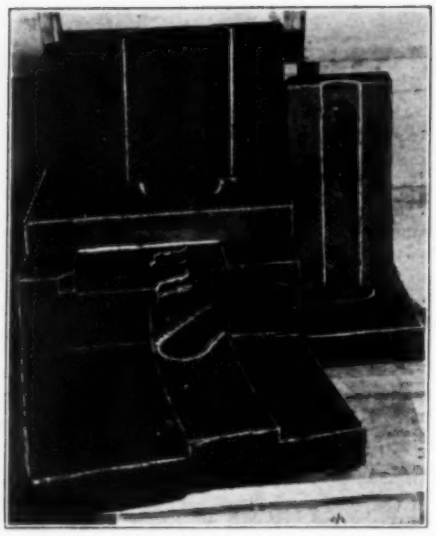


FIG. 13—SHOWING SET UP OF GATE AND RISER CORES

Fahr. nor has this been found necessary. If held true at the higher temperatures, it has been found that at the lower temperatures there is no appreciable tendency to change. The results obtained show that it is practicable to maintain a true circle within a limit of less than ¼-inch.

The size of one of these rings will be appreciated by referring to the illustration, Fig. 4, showing it slung vertically in front of a 2000-ton forging press.

The job on the six rings at this yard was completed after rough machining on a boring mill. To allow sufficient rigidity during shipment to the Mare Island and Puget Sound navy yards on the west coast and to care for any slight changes in shape when fitted in place on the ships, ½-inch finish was allowed on all machined surfaces. The roughing cut in the Norfolk yard was only to prove the castings. A shipping rig of old rails prevented change of shape during the journey.

Metal in these rings was a low nickel alloy steel about 0.33-0.40 per cent carbon and 1.5 per cent nickel. The physical results ranged from 95,000 to 100,000 pounds tensile strength, yield point 55,000 to 62,000 pounds and other characteristics equal or better than specification requirements.

After the problem of obtaining and holding the shape during the anneal was solved, the job was easy. The yard not only met its estimate, but beat it by 20 per cent.

The Whiting Corp., Harvey, Ill., removed its New York offices from the third to the sixth floor at 136 Liberty street on April 1. J. Ross Bates, vice president, is in charge.

British Iron and Steel Institute To Meet

This year the British Iron & Steel institute will celebrate the diamond jubilee of its establishment. The annual meeting of the institute will be held at the Institution of Civil Engineers, London, on May 2 and 3. B. Talbot, managing director, Cargo Fleet Iron Co., Ltd., president of the institute, will open the meeting, and will be succeeded by Professor Henry Louis, president-elect. The Bessemer gold medal will be presented to the Hon. Sir Charles Parsons at the beginning of the meeting on Thursday, May 2 and the annual dinner will be held at the Connaught rooms, London, on the same day. On the second day the Carnegie gold medal will be presented to Dr. Arthur Bramley.

Among the papers to be presented are the following: "First Report on Blast Furnace Plant and Practice," by a committee of the institute; "Brittleness in Mild Steel," by G. R. Bolsover; "The Differential Method for Measuring the Thickness of Hard Cases Without Sectioning Them," by E. G. Herbert and P. Whitaker; "The Transformation of Austenite Into Martensite in an 0.8 Per Cent Carbon Steel," by Dartrey Lewis; "Constitutional Diagrams for Cast Iron and Quenched Steels," by A. L. Norbury; "A New Method for the Production of Sound Steel," by the Hon. Sir Charles Parsons and H. M. Duncan; "The Oxidation of Iron and Steel at High Temperatures," by L. B. Pfeil; "The Microstructure of Rapidly Cooled Steel," by J. M. Robertson; "A Method for the Estimation of Hydrogen in Steel," by T. E. Rooney and G. Barr; "The A. I. B. Sinter Plant at Messrs. Guest, Keen and Nettlefolds, Ltd., Cardiff Works," by W. E. Simons; "The Influence of Pickling Operations on the Properties of Steel," by H. Sutton.

The autumn meeting of the institute will be held at Newcastle-on-Tyne, under the presidency of Professor Henry Louis, from Sept. 10 to 13. During the meeting, visits will be made to the North-East Coast exhibition, and the sessions of the meeting will be held in the Festival hall of the exhibition.

French Foundrymen Hold Meeting

The annual general meeting of the Association Technique de Fonderie of Paris, took place on March 21 at the Ecole Superieure de Fonderie, Paris, France. Leon Thomas, consulting engineer, was re-elected president for the year 1929-30. In the report it was stated that the number of members had increased from 809 to 896. During the year 118 new members were enrolled. The French foundrymen's convention will be held on Oct. 25 and 26, 1929.

Uses Powdered Fuel

The Combustion Engineering Corp., New York, has published a reprint of a paper presented by W. O. Renkin at the World Power and Fuel conference in behalf of the American Institute of Mining and Metallurgical Engineers. The paper describes the use of powdered fuel in various metallurgical establishments and its use in iron, steel and other furnaces.

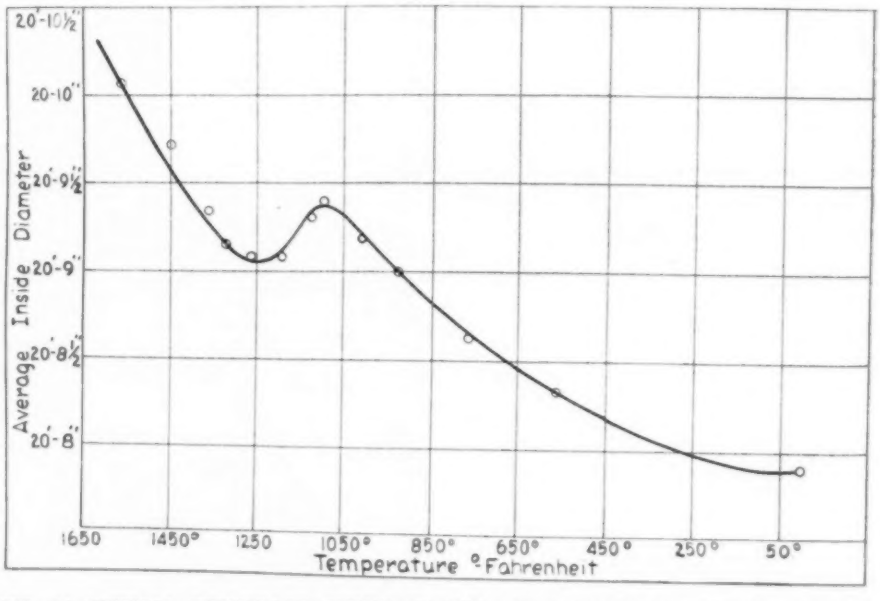


FIG. 14—TYPICAL SHRINKAGE CURVE OF DECK RING CASTING SHOWING ACTUAL INCREASE IN DIAMETER THROUGH THE CRITICAL RANGE

Questions & Answers on FOUNDRY PRACTICE

GENERAL

Hollow Ware Is Made on Molding Machine

QUESTION

We are contemplating the manufacture of skillets, dutch ovens and general household utensils and will appreciate any pointers you can give us on the subject. We are particularly interested in the analysis of the iron, grades of sand and equipment employed by the larger manufacturers in this line.

ANSWER

For many years the manufacture of that general class of castings known as hollow ware was regarded as a strictly hand proposition. Of course, the patterns were mounted on follow boards, but the manipulation of the sand and a great many of the intimate features connected with the making of the mold were considered so peculiarly sensitive that they could be accomplished only by skilled molders. This class of castings still is made by hand in many foundries, but the larger and more progressive shops have introduced machines and have demonstrated that the sand can be prepared and the molds made to a great extent by mechanical devices. Analysis of the iron used in these castings corresponds to that usually employed for making small castings. A typical analysis would show: Silicon 2.50 per cent, sulphur 0.08 per cent, manganese 0.40 per cent, phosphorus 0.50 per cent. Sand that is suitable for stoveplate and light castings, also is suitable for hollow ware. In fact, where a foundry already is equipped to handle a special or miscellaneous line of light castings, the only extra equipment needed for taking on hollow ware is some special grinding and polishing fixtures to impart a finish to the inside of some of the castings. Also, perhaps a plating outfit is needed if some of the ware is to be nickeled before it is marketed. Incidentally, and possibly as an item of interest in your plans, a great deal of hollow ware is made under the prison contract system and naturally offers strong competition. If you have a back file of THE FOUNDRY you will find a description of a hollow-ware plant and the methods employed in the April 1 and April 15, 1921, issues.

THIS department covers all problems relating to metallurgical, melting and molding practice encountered in making steel, malleable-iron and gray-iron castings. Questions submitted by bonafide subscribers to this department will be answered by members of the editorials staff of The Foundry, supplemented where occasion requires by the advisory staff whose personnel is as follows:

John H. Hall—Steel Casting
H. A. Schwartz—Malleable Cast Iron
J. W. Bolton—Gray Cast Iron

All questions should be addressed to The Foundry, Penton Building, Cleveland.

Q & A

Cleaning Core Boxes

QUESTION

We experience considerable trouble in wooden coreboxes with building up of deposits from core oil which look like paraffine. Do you know of anything that will dissolve this deposit or a wash that will eliminate it? We have been washing and cleaning the boxes with kerosene, but this does not work satisfactorily.

ANSWER

The deposit you refer to probably is rosin and may be removed with gasoline and we suggest that this be used for cleaning the coreboxes after the day's work is finished. The boxes should be scrubbed with gasoline so that every bit of the core binder is removed each night. Sometimes it may be advisable to give them a wash during the day if the sand sticks.

Kerosene may work if given plenty of time to soak as its solvent power is low. Gasoline exerts an excellent solvent action on rosin and of course on oils. Possibly, you might experiment with your core oils until you find one that does the work without causing sticking in the box. One with less rosin might do the trick.

Q & A

Gives Specifications

QUESTION

Are there any analytical standards for the purchase of core oil which will distinguish good oil from poor?

ANSWER

Core oil is generally a compounded oil and may be composed of linseed, soy bean and china wood or tung oils with rosins or other gums. After the oils and rosin are heated and mixed, some mineral oil is added to thin the mixture and distribute the binder. In standard specifications for pure oils such as linseed, soy bean, etc., limitations are given for various properties such as specific gravity, refractive index, iodine number, etc. Each of these properties indicates in some degree the purity of the oil. However, in the case of a commercial core oil which is a mixture, these characteristic tests will not indicate the composition nor will they indicate the value of the oil as a binder.

Low specific gravity would indicate a large proportion of mineral oil thinner as would a low iodine number and a large amount of unsaponifiable matter. These tests would have to be performed by a skilled chemist to obtain accurate results and even then the only reliable way to obtain a true idea of the binding qualities of the core oil would be to make up some square bars, one inch square and 14 inches long. Bake

with your regular cores and obtain the transverse strength using 12-inch centers between supports. These results will be the best index of how strong the cores will be. Baking under different conditions of temperature and time will also indicate the best practice to use.

V. A. Crosby presented a paper at the annual meeting of the American Foundrymen's association in 1927 in which he gave the following specifications whereby the Studebaker Corp., South Bend, Ind., purchased its core oil: Specific gravity, 0.9310 maximum at 60 degrees Fahr.; flash point, 165 to 195 degrees Fahr.; fire point, 180 to 210 degrees Fahr; iodine number, 155 minimum; saponification number, 148 minimum; acid number, 34 to 41; color, light clear amber through half section; odor, positively not fishy.

While this specification is suitable for the firm named, it may not work satisfactorily for all foundries. Therefore, it will be necessary to carry on an extensive investigation to determine the proper combination of oils to meet the purpose in mind.

Q & A

Gates Used on Pistons

QUESTION

Small holes are revealed at the point where the gates are broken from our piston castings and we should like to know if this condition is due to the shape of the gates, the iron or the sand. Are small pistons poured from the top or the bottom. What is a pop gate and how is it used? What is the proper way to make a core-box for a core ½ x 12 inches? What is the most suitable core sand mixture for a core of that size?

ANSWER

Assuming that you are referring to automobile engine pistons, they are poured from the top and also from the bottom. They are made in green sand molds either with green sand or dry sand cores and satisfactory castings are secured in all cases if ordinary precautions are observed. The position in which the mold is made has no bearing on the success of the method. Your trouble may be due to an insufficiently vented core or to an insufficiently vented body of sand in the vicinity of the gates. Use a fairly open grain sand, as dry as possible, not rammed too hard and if your melting practice is normal you should have no further trouble.

A pop gate as the name implies is a small vertical runner opening directly into the upper part of a mold cavity. It is used singly, also in groups. A core making machine of the extrusion type is the most satisfactory device for making small round cores. However, if the number of cores is too small to warrant the installation of a machine, fairly satisfactory cores may be made in a split box. The two halves of the box are filled with sand while lying on the bench side by side. The two halves then are brought together face to face, one half of the box is removed and the complete core is rolled either on to a plate or a former. For small cores an oil binder usually is favored.

Q & A

Plug Tap Hole at Start

QUESTION

It has been a general practice in most foundries in the past to blow the breast upon putting the blast on the cupola for melting gray iron. I am wondering if in your experience, you have found foundrymen that do not blow through the breast at the beginning of a heat. As I understand it, the foudrymen have trouble with the slag chilling up against the tap holes in cases where they do not blow, resulting in difficulty in tapping

ANSWER

Some foundrymen plug in the tap hole before starting the blast. This is knocked out easily when sufficient iron for tapping has been melted. No trouble will be experienced from slag if your bottom has been thoroughly heated before the blast is put on. The fire should be kept in the cupola 2 hours before starting the blast.

STEEL

Gives Steel Valve Data

QUESTION:

I would appreciate any information on making high pressure steel valves, globes and angles from 2 to 14 inches. I would like to know the analysis of the steel required and whether you advise the cores to be made of oil sand. If oil sand is suggested, is there any special oil used for steel?

ANSWER:

One of the large valve manufacturers mounts its patterns on molding machines and dries the resulting mold. The number of valves to be mounted on the plate depends on the size of the valves, molding machine size and its accompanying flask equipment. Assuming that you have a 60 x 60-inch rollover pattern draw machine, four 8-inch standard valves may be accommodated nicely without crowding. In the drag half the adjacent flanges of the valves are connected together by deep gates which come under the long runner in the cope half. The cope half contains the runner, risers and gate. The runner of ample size extends nearly across the joint and is perpendicular to the flange sections. The gate is placed in the center of the mold and this through the runner and deep gates at the flanges allows metal to enter each mold at opposite ends simultaneously. Risers are connected to the top of each flange. A pad about 4 inches long, 1 inch high and the width of the flange forms the junction of the riser to the flange. Above this pad the riser should be two inches or more larger in both dimensions to contain sufficient metal to give good sound castings.

The channel or deep gate used in the drag and the gate, runner, pads and riser blocks used in the cope are separate pieces, and are placed in the proper positions depending on whether a drag or cope is desired. After the molds are made they are given a coat of silica wash and taken to the oven and dried. The molds are dried at about 450 degrees Fahr., for 4 hours, removed from the oven, assembled and poured.

Cores may be made from silica sand and oil, new silica sand and clay or from old sand and a pitch binder. Smaller cores probably would be best made from oil and sand. For larger cores, oil sand would be rather expensive. The cores must be made, like the mold, of highly refractory silica sand to withstand the temperature of molten steel. They also should be made so that they crush easily when the steel begins to contract on cooling. Otherwise the castings will come out cracked. No special oil is used for coremaking. The best core oils have a linseed base, and perhaps you will find it best to make a compound of linseed oil, rosin and crude oil. Core oil manufacturers who advertise in THE FOUNDRY will be glad to assist you in selecting a compounded oil, or advise you on the use of linseed oil.

According to the tentative standards of the American Society for Testing Materials, valves, fittings and flanges used in service, where temperatures up to 750 degrees Fahr. are reached, the analysis of the steel should be approximately: Carbon, 0.15 to 0.40 per cent; manganese, not under 0.50 per cent; silicon, not under 0.20 per cent; phosphorus, not over 0.05 per cent; sulphur, not over 0.05 per cent. These castings should be allowed to cool in the mold to a temperature below the critical range (1325 degrees Fahr.) They are then reheated to approximately 1600 degrees Fahr. for

3 hours, allowed to cool and then tumbled.

Another mixture used for valves is that designated as class *B* steel castings of the American Society for Testing Materials. This calls for: Phosphorus not over 0.06 per cent; sulphur not over 0.06 per cent. The castings should be annealed as previously mentioned. A third steel used by some for this purpose contains 0.20 to 0.40 per cent carbon and 1.20 to 1.60 per cent manganese. These castings are annealed at 1650 degrees Fahr.; cooled in air, and then reheated to temperatures ranging from 1000 to 1250 degrees Fahr. Nickel or nickel-chrome steel containing about 0.30 per cent carbon sometimes is used.

Q & A

Makes Chromium Steel

QUESTION

We are using a 2-ton acid lined electric furnace and a customer has asked us to make a large number of steel castings containing not less than 27 per cent chromium and not more than 3 per cent carbon. Can you tell us how to make this metal and also give us details regarding melting and pouring operations?

ANSWER:

Unfortunately we have no data on hand to give the exact procedure with large additions of chromium, but presume that the operation is similar to small additions except perhaps that more time should be given to incorporate the ferrochromium into the metal. Barton, and others state that acid furnace operation is not the best practice owing to the affinity of chromium for oxygen. This causes large losses of chromium which is carried out in the slag. Barton advises deoxidation of the steel with addition of ferrochromium 5 minutes before tapping. However, this refers to steels containing 1 to 2 per cent chromium, and we believe that in your case a longer time, probably an hour, would be required to incorporate the ferrochromium.

In his case only about 60 pounds of ferrochromium for a 4000-pound charge were added while you would require about 1850 pounds of 67 per cent ferrochromium which allows for a 15 per cent loss. With such a large amount of metal, you can imagine the cooling effect on the molten bath. Barton in his book, "Refining Metals Electrically," says: "In melting chrome steel the same procedure is followed as with a heat of carbon steel only with slight differences. Naturally, possessing a high degree of oxidation, it would be foolish to add ferrochromium to a bath of oxidized metal. Therefore, the slags must be thickened and after the silicon has started to reduce, the ferrochrome may be added. This will be 5 or 10 minutes before the heat is ready to pour, and if possible the chrome should be added not over 5 minutes before the heat is tapped from the furnace.

"To obtain such conditions and at the same time keep the silicon content at the proper figure, requires considerable judgment as to the methods of manipulating the slag to attain the required conditions. The ferrochrome should be moistened so as to kick through this slag, and it is good practice to rabble the bath well to assure that the chrome actually has penetrated into the steel. Additions of chromium should be approximately 10 to 15 per cent higher than is desired in the finished steel, that compensation may be made for the higher loss."

However, Kerns in an article which in the March 15, 1926, issue of THE FOUNDRY, states that losses of chromium are not so high and only allowed for a 4 per cent loss. The steel he melted closely approximates that which you desire except that the carbon is considerably lower. Your higher carbon would allow the use of ferrochromium with 4 to 6 per cent carbon which is cheaper than 2 per cent maximum.

GRAY IRON

Hard Iron Should Be Used

QUESTION

We have been considering for some time the manufacturing of a ball for grinding cement; also for making stars for use in foundry rattlers. We have decided that the following analysis is quite satisfactory for the cement grinding balls:

Element	Per Cent
Carbon	3.00
Manganese	.29
Phos.	.466
Sul.	.143
Silicon	1.31

We were wondering if you could tell us how to get a mixture of iron in the cupola that would give us this analysis. What raw materials would we have to use to get this result?

ANSWER

To meet the tentative analysis for cement grinding balls that you sent to us, we suggest the following mixture based on 2000 pound charges: Steel scrap, 300 pounds; machine scrap, 500 pounds and pig iron, 1200 pounds. The pig iron should be of the following analysis: Silicon, 2.00-2.25 per cent; manganese, 0.20-0.40 per cent; phosphorus, 0.50-0.70 per cent and sulphur, 0.05 maximum.

It is our opinion that your analysis is too high in silicon to obtain the best results. Generally, grinding balls are made of white cast iron and cast in iron molds. An analysis for this type of casting that has given excellent results in abrasion and wear resisting qualities is: Silicon, 0.70-0.90 per cent; manganese, 0.70-0.90 per cent; chromium, 0.60-0.80 per cent. The chromium makes the iron tough and abrasion resistant. Many foundries, especially those in the mining districts make the balls entirely from scrap iron and cast in iron molds to obtain the necessary chilled properties.

Q & A

May Use Steel Scrap

QUESTION

We are running our shop on light machine castings calling for a soft iron. Recently we have taken in some work that calls for a closer grained casting, harder than ours but still machinable. We do not wish to add steel in the cupola as it may spoil our light castings. Would ferromanganese harden the iron? The production of the harder iron will run about 600 pounds a day.

ANSWER

The first suggestion is to add the steel on the last charge of the day, holding the special castings until last to be poured. Use from 10 to 15 per cent steel. The other resort is to use steel in the ladle itself. The procedure is to heat the scrap steel which must be of light section, and place it in the ladle pouring the iron on top and stirring well to be sure that the steel is all melted before pouring. This necessitates that the cupola iron be hot to melt the steel. By heating the scrap the molten iron is not cooled off as much.

Ferromanganese is used as a deoxidizer and desulphurizer and does not harden iron unless considerable is used and then you will have the so-called manganese chill which you do not desire.

Q & A

Chill Not Deep Enough

QUESTION

We have been trying to make some cast iron pulley wheels for the city cable cars. The wheels are about 12 inches in diameter and have a heavy flange about 2 inches thick, and must be chilled to a depth of ½-inch. So far we only can obtain a chill of ⅜-inch. We would appreciate any information on obtaining the proper chill. We understand that one foundry uses an addition of sulphur in the ladle to get the chill. Would this method

increase the chill in pulley wheels?

ANSWER

Adding sulphur in the ladle or using high sulphur iron will give a deeper chill, but this method is not good practice. It is better to obtain the proper depth of chill by using the proper mixture for this purpose. Reduction of silicon with use of heavy chills will allow any desired depth of chill to be obtained. Chilled car wheel and chilled roll makers regularly obtain chill depths from 1 inch upward. For your purpose we believe that if you reduce the silicon in your mixture to about 1 per cent, and use a chill that will extend 3 inches beyond the outermost edge of the casting, you will get the proper depth of chill.

If your iron is poured extremely hot, the chill will be deeper than if poured cooler. The chill pieces used must be large enough to absorb the heat from the metal without getting too hot. If the chills are light, they heat up quickly and no great benefit results. Chills should be clean and free from rust otherwise blows will occur. Shellacking the surface or applying a light coat of mineral oil will prevent moisture collecting on the surface overnight.

MALLEABLE

Chills Blow Castings

QUESTION

We have experienced considerable trouble recently from blow holes in our malleable castings, due apparently to chills in the cope half of the cores. We have coated the chills with shellac and lake sand, heavy machine oil and fine sandblast, and kerosene oil and black lead sand. None of these precautions has had any effect. We find that after the molds remain on the floor for a few hours the chills become quite damp. We shall appreciate your advice on the proper preparation to employ to prevent a continuation of this trouble.

ANSWER

Any of the coatings you have enumerated are satisfactory when applied to chills that form parts of cores for malleable iron castings. At the same time none is of any use where conditions induce a heavy condensation of moisture on the chills. If your sand is hot and your chills cold the moisture will condense on the chills to such a degree that no treatment can save the casting. Even under the most favorable conditions moisture will collect slightly on any chill left in a mold for several hours and for that reason precautionary measures are required in making the molds. For example the sand should be dead cold and the cores should be placed in the mold while still warm. If possible a small riser should be provided directly over the chill, so that if a little steam is generated it will have a chance to escape.

Without actually seeing the casting and observing the conditions under which the mold is made we cannot express a positive opinion. However, it is barely possible that the blow holes are caused by some other factor or factors besides dampness. The chill may interfere with the free venting of the core and in that way cause gas bubbles from the core to collect in the vicinity of the chill. Cut a large riser in one of your molds so that you can watch the action of the iron when it covers the core. Then you easily can determine whether the fluttering is caused by gas from the core or steam from the chill.

The most satisfactory method for coating chills and attaching them to the cores is to ram them in the corebox with the core and then give the core and exposed part of the chill a light coat of blacking either before or after they have dried.

Another contingency should not be overlooked. It is possible that the coating designed to prevent moisture from adhering to the chill, has been painted on so thickly that in itself it constitutes a menace from the amount of gas evolved when covered with molten iron. Manifestly only a sufficient amount of covering material should be placed on the surface to prevent condensation of moisture on the bare metal chill.

Q & A

Will Aluminum Help?

QUESTION

We have read with interest a number of answers on foundry practice which have been published in THE FOUNDRY, and wish your advice on a few problems of our own. We have a 15-ton reverberatory malleable melting furnace and during the process of melting we skim twice, sometimes a third time. Our pig iron runs around 46 per cent, and the remainder is defective castings, sprue and purchased railroad scrap. We are running into quite a bit of defective castings due to not being able to remove all slag from the bath and would like to have your opinion as to how this may be remedied. Would aluminum used in the sense of either a purifier, purgative, or scavenger aid? If not aluminum, do you think it would be better to increase the manganese content? Could ordinary fireclay be thrown on the bath to thicken the slag so that it could be removed? Our heats are going in with a silicon content of 1.16 per cent, and come out between 0.80 and 0.85 per cent. Nature of castings poured—all railroad work, small with an average weight about ten pounds.

ANSWER

We do not suggest the use of aluminum for any purpose in malleable iron production because it has properties similar to silicon. In other words it will have a tendency to promote the precipitation of graphite in the hard castings.

You refer to the fact that you cannot remove all the slag from the bath but it appears as though your difficulty comes from not getting the bath hot enough. If the bath is not hot enough it becomes sluggish and the slag is entrained in the metal because of the lack of fluidity. The slight amount of slag left on the bath should not interfere, because some malleable makers do not remove the last slag, but allow it to remain in the furnace and run it off after the iron is out.

There may be another cause for your difficulty. This may be due to oxidizing the bath too much with a lowering of the silicon, manganese and carbon. This may appear in the later stages of pouring, and may be confirmed by observing the appearance of the metal poured. If it looks good and hot but pours sluggish and chunky, the metal has been burned. If it occurs in the first iron poured, dose the heat with ferromanganese and ferrosilicon. This will raise the silicon, manganese and carbon, but will have to be done properly to get the correct proportions of these elements in the heat.

You do not state what manganese percentage you have at present so it is difficult to say whether to increase it. If the manganese is too low, the sulphur is not taken care of correctly. However, if it is too high it will form hard manganese-iron or manganese-carbide inclusions which will cause difficulty. If your manganese is about 0.25 per cent it will be about right. Usually in melting about 40 to 50 per cent of the manganese will be lost so you can figure how much to charge. If the sulphur runs a little high, the manganese may go up to 0.30 per cent.

Your silicon loss is about right as this element is figured as 28 per cent loss of the amount charged. Carbon loss is figured as 15 to 19 per cent.

Perhaps it might pay you to check-up on your defective castings and watch in what part of the heat they appear. That is to say whether defects appear throughout the heat, or whether at the beginning or end of the pouring of the heat.

How and Why in Brass Founding

By Charles Vickers

Reaction Is Doubtful

We are using a mixture of powdered glass and charcoal as a covering on our brass to prevent its taking up oxygen while it is being superheated to the pouring temperature in an oil-fired furnace, and we would like to be advised whether or not it is possible for the metal to absorb this flux, and for it to remain in the metal as silicate of soda? We ask this because after our valves have gone through steam and water tests there remains a whitish ring after drying out. We would like to know what causes this condition. When we used a coal-fired pit furnace for melting, with only a charcoal covering on the metal, we never experienced this condition.

Regarding this matter from a chemical viewpoint we are unable to visualize how any reaction could possibly occur involving the production of sodium silicate. We do not know where the necessary sodium could come from, unless soda ash also is added, and then it would require quite a stretch of the imagination to believe that sodium silicate could be produced, under the conditions obtained in the furnace. Also, we believe that even if present, sodium silicate would have no effect whatever upon the metal.

However, the question has been raised and it is most advisable to settle it to the satisfaction of all. Simply melt without the glass. To hold down the charcoal, use borax instead of glass, and note the effect upon the valves. Also, instead of charcoal or borax a covering of blacksmith's coal can be used. Crushed, old crucibles also will form a suitable covering for the metal. As it would be utterly impossible to get any silicate of soda or anything else out of such coverings, such a trial will settle that question. If the trouble continues after the change of brass covering, it might be caused by some impurity in the water used in testing the valves.

The writer by no means intends to laugh off the silicate of soda suggestion, for he has met this same peculiar difficulty before. While it is not at all easy to see how silicon could be reduced from glass by carbon, it *might* be possible, and a little silicon would give a peculiar discoloration to a valve metal, but it would show as the castings were taken from the sand. Also it would be a thousand chances to one that the casting would come dirty as well as discolored. Inexperienced people sometimes advise the addition of silicon to red brasses as a deoxidizer. In this capacity silicon is harmful, and under no circumstances should be used. We are doubtful though of the possibility of silicon reduction, in such a furnace.

Ductility Is Low

We are having difficulty obtaining an aluminum alloy suitable for casting agitators, as the casting carries prongs that have to be bent to secure the rubber paddles, and the metal must also be soft enough to bend back again when the paddle is worn out, in order that a new one may be inserted, then the prong be bent back again. We have tried mixtures of No. 12 *alloy with silicon, and mixtures of scrap aluminum and No.* 12, *but they all are too brittle after cooling. It appears that shortly after the castings are made and cooled off, the prongs could be bent readily either way. After the castings have seasoned for about* 30 *days, they seem to become harder or more brittle. Can you advise from the sample sent you, whether the metal appears to have been overheated in such a way as to cause this condition?*

The reason the castings break is that the alloys used are lacking in ductility. Elongation of No. 12 alloy after casting is rarely more than 1.5 per cent, and that is negligible. This lack of elongation greatly limits the purposes for which aluminum can be used. While ductile alloys can be made, ductility is quite small compared to the copper base alloys. With these it is quite easy to obtain 50 per cent elongation with quite high tensile strength up to 70,000 pounds per square inch. This is about double the strength and elongation of copper itself, but with aluminum, no one, we believe up to this time, ever has produced an alloy that in the sand cast condition, has greater elongation than pure commercial aluminum ingot. The writer's work with aluminum and aluminum alloys began when the light metal cost four dollars per pound, and experiments have continued to the present. In all those years that have passed the highest results obtainable have been 20 per cent elongation, and 20,000 pounds per square inch tensile, in sand-cast test bars. These bars were made to size, risered on the grip ends with a pouring temperature of 750 degrees Cent., and we believe these results have not been exceeded greatly by anyone else, even using silicon. This shows that ductility is not to be expected of commercial alloys, and we doubt greatly, in view of the fact that these holding prongs are expected to stand bending back and forth for insertion of new wearing parts, the wisdom of this type of construction. We suggest as aluminum must be used because of its low specific gravity, that some more practical method of retaining the rubber paddles be devised; one that will require no bending of the structure.

However, if the paddles are simply to be inserted, an alloy can be selected that will bend to a limited degree. A suitable alloy would be one containing copper 4 per cent; aluminum 96 per cent. In making this alloy it will be necessary to use nothing but virgin aluminum, so scrap metal cannot be used. This will be the case with any ductile alloy that could be substituted for the present ones used. We suggest the copper-aluminum alloy with 4 per cent copper because the foundry workers are familiar with the copper aluminum alloys, therefore, no changes in practice are necessary. An inspection of the sample casting does not suggest the aluminum has been overheated. The casting is of peculiar shape and to fully fill the mold the pouring temperature of the aluminum must be quite high if the gates are cut into the periphery of the casting and that is likely to cause dirt and porosity where the first metal lays. The way we suggest it to be gated is to mold it with the prongs downward, and place a ring of thin pencil gates on top of the dome. It is merely a question of rigging, and study, but when carried out, production need not be held up, and much better castings will result. It may be stated in conclusion that overheating has not the least influence on the lugs breaking.

BLAST FURNACE
Operation Affects Quality
of Pig Iron and Castings

By A. L. Boegehold

Part II

ROYSTER and Joseph, *Iron Trade Review*, March 13, 1924, concluded that the stock in a blast furnace travels in converging lines to the areas in front of the tuyeres where combustion takes place and this indicates that practically all of the iron must pass through these zones and come in contact with the gases which are capable of reoxidizing the iron. The proportions of O_2, CO_2 and CO in these zones depends on the rate of supplying air and the combustibility of the coke. In an operation like that when heat 8 was produced in furnace *E*, where the coke was slow burning and excessive air was supplied, the gases in front of the tuyeres would be much more oxidizing in nature than in the case of the operation of *C* furnace when heat 6 was produced where a combustible coke was used and a minimum of air per pound of iron was supplied. However, the oxidation at this point probably would not be an oxidation of the iron as much as burning out of carbon and silicon. This is presumably the reason why the silicon content of an iron is sometimes lower than is indicated by its temperature as it leaves the furnace.

An iron containing silicon normal to its temperature before passing through the combustion zone may come out of the tap hole with lower silicon than normal for its temperature, due to:

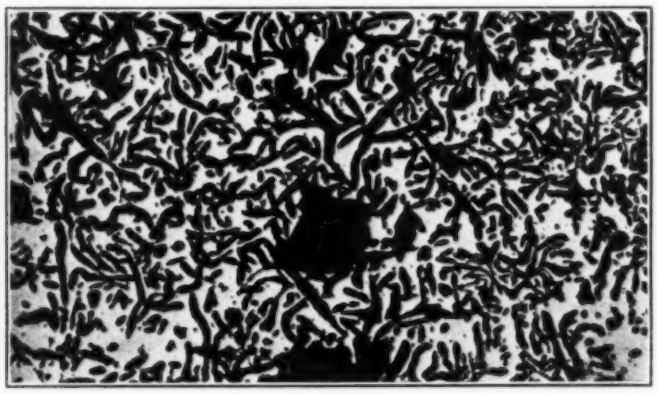
1. Burning out of silicon in passing through the combustion zone, and
2. Increase of temperature due to heat liberated by oxidation of the silicon.

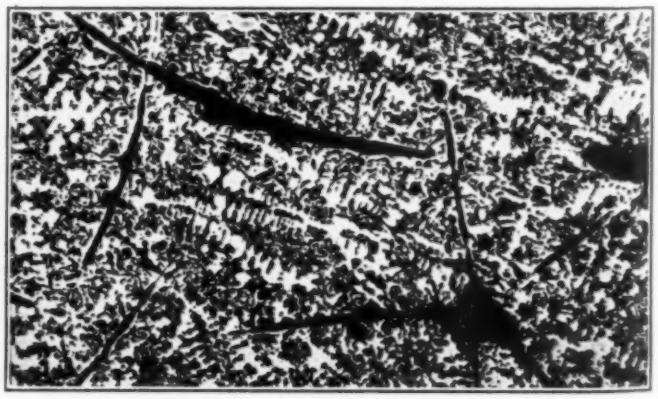
Let us assume that we could measure the temperature and silicon content of iron inside the blast furnace and we were studying these conditions at different times during the day on one blast furnace. We might find in one case an iron at 2650 degrees Fahr. just before it passed through this combustion zone, to contain 2.50 per cent silicon, which then passed through the combustion zone without becoming oxidized. Another determination later in the day might show us an iron with the same kind of a slag at 2725 degrees Fahr. and containing 2.75 per cent silicon.

Now, if the second iron passes through a more oxidizing combustion zone than the first, causing a 0.25 per cent loss of silicon by oxidation resulting in perhaps a 25 degree increase in temperature, we will have coming out of the tap hole an iron of 2.50 per cent silicon content but 100 degrees Fahr. hotter than the other 2.50 per cent silicon iron at 2650 degrees Fahr. This temperature difference of like silicon content irons would be still greater if the latter iron were made with a basic

Describes the Tests

MOISTURE in the blast has an effect on the resulting iron obtained, which also persists in the castings. Examination of the microstructure of a series of samples of pig iron showed considerable variation for the different lots. Dilation curves obtained for each of the pig irons also showed considerable variation. Approximately three weeks were spent in investigating each lot of pig iron, and the author includes a description of the tests and the various types of specimens used for determining the characteristics of each lot. This is the second section of a paper presented at the recent convention of the American Foundrymen's association in Chicago. The third section will appear in an early issue.





FIGS. 3 AND 4—GRAPHITE DISTRIBUTION IN PIG IRON IN LOTS 1 AND 7, UNETCHED AT 25 DIAMETERS. LOT 1 SHOWS SHORT, THICK PRIMARY GRAPHITE FLAKES AND LOT 7 SHOWS LONG, THIN PRIMARY GRAPHITE FLAKES

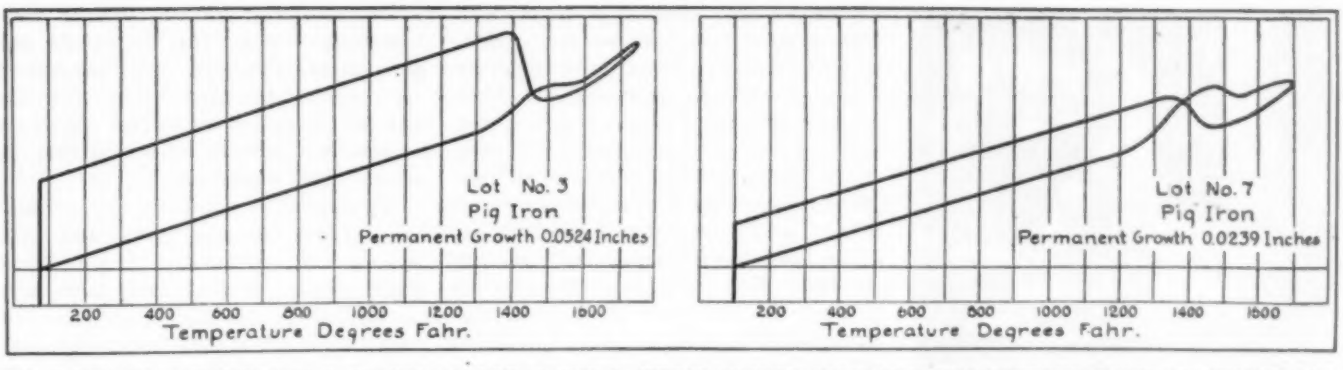

Lot No. 3
Pig Iron
Permanent Growth 0.0524 Inches
200 400 600 800 1000 1200 1400 1600
Temperature Degrees Fahr.
Lot No. 7
Pig Iron
Permanent Growth 0.0239 Inches
200 400 600 800 1000 1200 1400 1600
Temperature Degrees Fahr.

FIG. 5—DILATION TEMPERATURE CURVES OF LOTS 3 AND 7. THESE CURVES SHOW THE TWO EXTREME TYPES OF CURVES AND THE OTHERS RANGE BETWEEN

slag and the former with an acid slag. Control of coke quality would control such a situation by reducing the amount of oxidation possible in front of the tuyeres.

Table III, which was presented in Part I, shows also the variations in blast temperature, pressure, composition of burden, slag analysis, slag volume, casting temperature and amount of water introduced as humidity per pound of iron produced. The variation in the last mentioned item amounts to 550 per cent. This factor is important in its influence upon coke consumption and the production of sufficient heat in the furnace. Of the eleven heats recorded, the largest amount of water introduced per ton of iron produced was 121.6 pounds, but under some conditions it could easily amount to 200 pounds of water per ton of iron.

For example, under the conditions of operation of heat 8 in furnace *E*, where 5.45 pounds of air was supplied per pound of iron produced, if the humidity had been 80 per cent at 80 degrees Fahr. or 9 grains per cubic foot of air, there would have been 213 pounds of water introduced into the furnace per ton of iron produced. It is not difficult to imagine that such a quantity of water breaking up into its components, hydrogen and oxygen, and entering into the blast furnace reactions will have a pronounced effect upon the quality of the iron in addition to its effect upon the utilizable heat available.

These points of difference have been reviewed simply to refresh our minds with how details of blast-furnace operation might vary and still produce iron of the same analysis. Our purpose is to take these irons of like analysis, but totally different in nature of environment while being produced in the blast furnace, and show by experiment in the foundry that the resultant physical properties of our cast irons made from these pig irons is influenced a great deal by that physical character conferred upon the pig iron by these variations in blast-furnace operation. In view of variations in so many factors affecting the result, it is appreciated that we cannot realize the ideal method of experimentation where only one factor is varied at a time. All we can hope is that there might be two or three factors having a big enough influence on our results to overshadow the effects produced by the remaining variables. So much for the manufacture of the raw material.

The chemical analysis of the 11

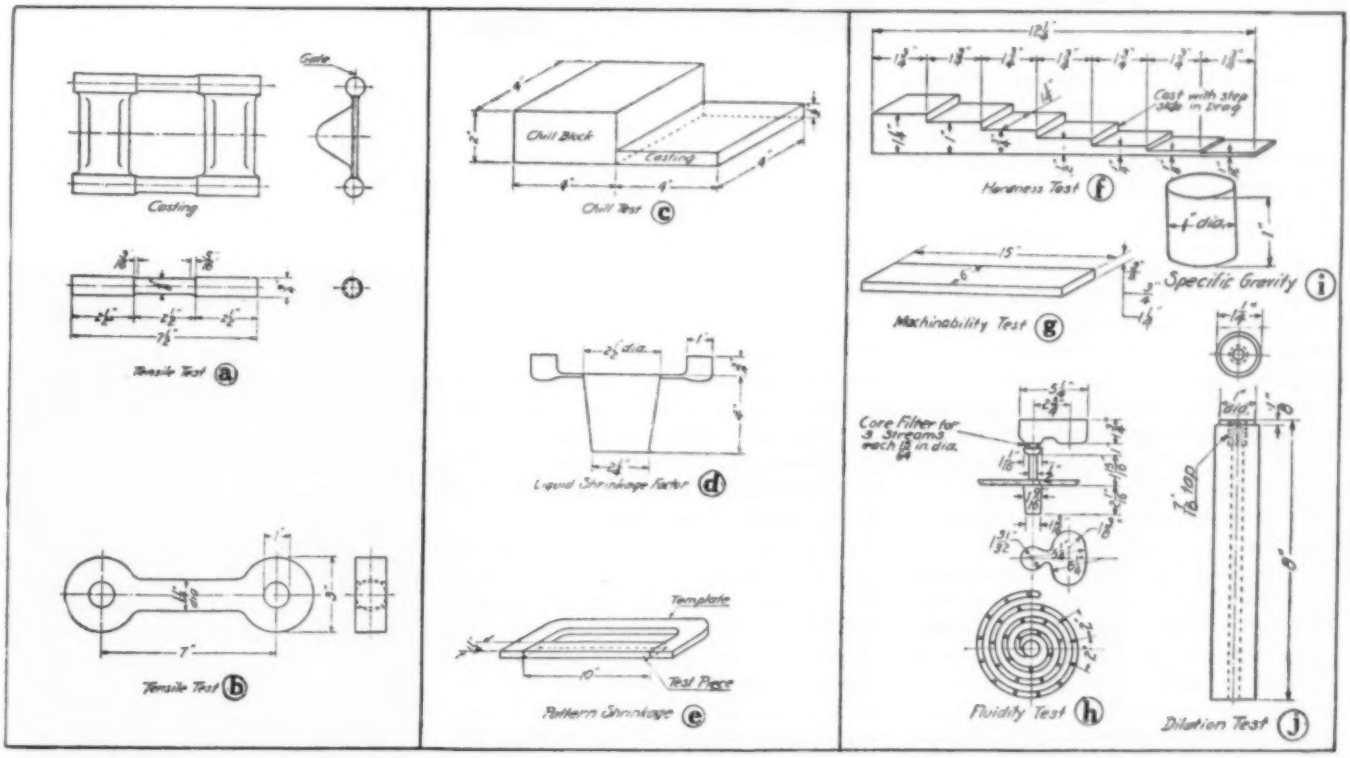


FIG. 6—SHOWING THE TENSILE TEST SPECIMENS, CHILL TEST BARS, LIQUID SHRINKAGE TEST, PATTERN SHRINKAGE, HARDNESS, MACHINABILITY, AND FLUIDITY TEST BARS. SPECIMENS FOR SPECIFIC GRAVITY AND DILATION ALSO ARE SHOWN

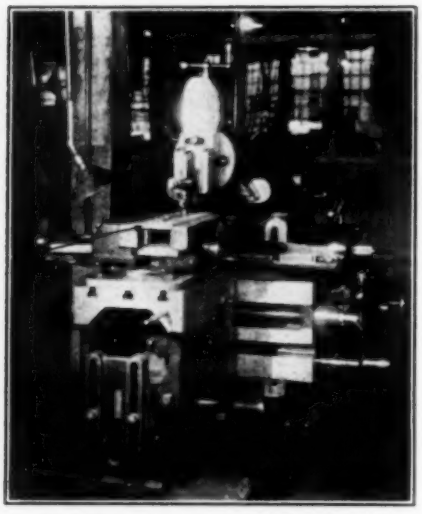


FIG. 7—MACHINABILITY TEST

casts of pig iron is given in Table IV. An attempt was made to get all samples of iron with silicon between 2.40 and 2.60 per cent. This was not quite realized, but all the analyses shown would be acceptable for No. 2X malleable pig iron. It will be noted that lot 4 contains 0.066 per cent sulphur. This was selected as an *off* or *bad* heat of iron to note its effect upon the properties of the cast iron made from it. The spread covered by the carbon contents is quite wide reaching from 3.61 to 4.09 per cent.

Two distinct types of microstructure were observed. An example of one type is that exhibited by lot 1 pig iron, shown in Fig. 3, where the primary graphite flakes are short and thick with secondary flakes fairly large and far apart. The other type is exhibited by lot 7 pig iron, shown in Fig. 4, in which the primary flakes are long, thin, straight, and far apart with a matrix of finely divided close packed secondary flakes.

Structures Vary Considerably

The types of fracture of pig iron range from coarse open black fracture with large primary graphite flakes down to fine-grained gray fracture, as well as intermediate types containing patches of the fine-grained structure throughout a coarse black structure. Reproductions of some of the dilation temperature curves for the various pig irons are illustrated in Fig. 5.

It appears that there is a beginning of graphite precipitation around 1250 to 1300 degrees Fahr. upon heating, which causes an increased rate of expansion until the A_c point is reached between 1450 and 1500 degrees Fahr., at which point the combined carbon goes into solution in the iron, causing a contraction before expansion is resumed. Upon cooling, graphite precipitates out causing a marked expansion in the neighborhood of 1425 to 1450 degrees Fahr. This expansion is permanent and persists down to atmospheric temperature. The great difference in dilation characteristics of various pig irons occurs in the magnitude of these expansions upon heating and cooling. For example, curve for lot 3 pig iron shows a small expansion upon heating and a large expansion on cooling through the A_r range resulting in a permanent growth of 0.052-inch. On the other hand, curve for lot 7 shows a large expansion upon heating between 1200 and 1500 degrees Fahr. and a comparatively small expansion upon cooling through the A_r range resulting in a permanent growth of 0.024-inch, a smaller figure than previously mentioned.

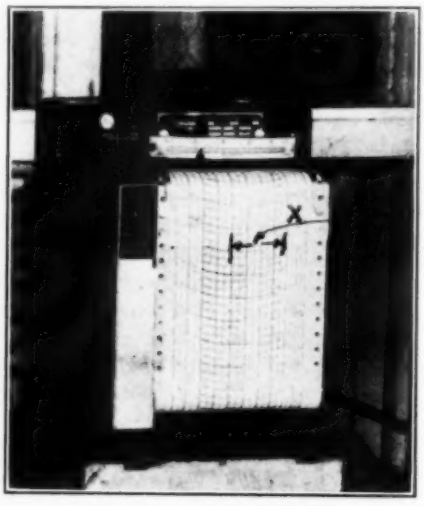


FIG. 8—TEST RECORDER

Curves for other lots of pig iron show characteristics intermediate between these extremes. In the study of dilation characteristics of cast irons made from those pig irons, we shall see the relation between pig iron and cast iron dilation characteristics.

As already mentioned, these pig irons of known history were obtained in approximately 75-ton lots and studied one at a time by converting into cast iron and measuring various properties of that cast iron. The investigation of each lot of pig iron lasted about three weeks.

Each day about 7 to 8 tons of iron were melted from raw materials, 50 per cent of which was of the pig iron to be tested and the remainder of return scrap from the day before, silvery iron and steel. Most of the 7 or 8 tons of iron melted per day was cast into automobile engine flywheels. The metal used for the series of test bars poured was taken after 14 ladles of 500 pounds each had been drawn from the cupola and poured into flywheels. This precaution was taken to allow time for the cupola operation to come to more or less equilibrium after starting up effects had disappeared.

All test bars were poured as near as possible between 2425 and 2500 degrees Fahr. measured on metal running from a 500-pound ladle with an optical pyrometer. The procedure was to obtain a full ladle and pour from it one flywheel to enable the making of a temperature determination. The first flywheel from a ladle was usually in the neighborhood of 2550 to 2575 degrees Fahr. Successive flywheels were then poured until the temperature of the metal had dropped to 2510 degrees Fahr. Then the ladle was moved over to the row of test bar molds and these were poured until the metal had dropped to 2425 degrees Fahr. below which temperature the metal was used again for flywheels. In this manner all the test bars were obtained from two successive ladles near the middle of the 7½-ton cupola heat. A sample for chemical analysis was taken from each of the two ladles used to pour test bars.

Make Many Test Bars

The sketches in Fig. 6 show the various test bars employed. Figs. 6a and b show the tensile test bars. These were molded in a horizontal position in green sand. The ⅝-inch diameter bars cast in pairs were fed from two shrink bobs placed so as to join the shanks of the test bars. The 1¼-inch test bars were fed from a heavy riser. The bars were pulled with their cast surface intact. The transverse test bar was made as described in A.S.T.M. *Standard* A48-18, except that green sand was used.

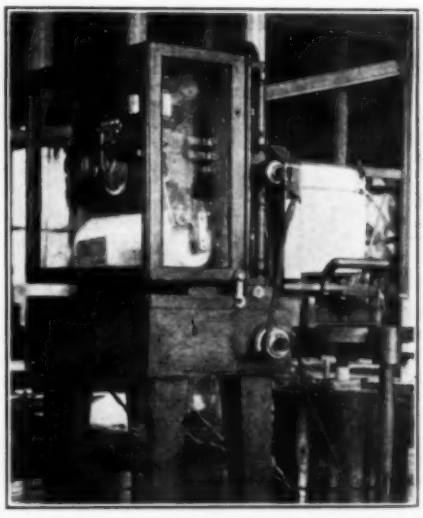


FIG. 9—DILATION TEST

The transverse bars were cleaned by brushing and were loaded transversely between 12-inch centers.

Fig. 6f shows the step bar for hardness determinations. Because brinell hardness is the standard of hardness in our foundries it was chosen for hardness determinations. This test bar was cast in a dry sand core mold horizontal with the step side of the casting in the drag. This is an important factor because by casting this bar with the steps in the cope different hardnesses result.

Fig. 6g shows three slabs of different thickness which were used for the machinability test. This test consists of determining the power required to remove metal ⅛-inch deep with 0.027-inch feed at the rate of nine strokes per minute. This test was conducted on a shaper as shown in Fig. 7. The power curve obtained is shown in Fig. 12. The average width of the curve is taken as the power required. The various cast irons were compared with respect to this quantity. Hardness determinations were made on these slabs as well to determine effect of section size on hardness when cast in green sand.

Fig. 6h shows the fluidity test bar which was copied from that described by C. Curry in the *Transactions*, A.F.A., Vol. XXXV. This bar was cast in a dry sand core. Fig. 6c shows the mold for testing tendency to chill. The ½ x 4 x 4-inch specimen cast in green sand against the steel block was broken perpendicular to the chilled side after cooling to atmospheric temperature and measurement made of the total penetration, as well as the depth of that part of the chill which contained no gray spots in the fracture.

Fig. 6d shows the test sample used to measure the volume shrinkage. This was provided with a thin gate and runner to the riser, so that there would be no feeding after the mold was filled. The mold was made in dry sand core and carefully measured before closing. The resultant casting usually contained a shrinkage depression at the top.

Measurements of the volume of the casting and volume of the shrinkage depression were made by noting the weight of water displaced by immersion of the casting (1) as cast and (2) with the shrinkage cavity filled with paraffin. This gave the total volume shrinkage compared with the original mold and also the volume occupied by the pipe.

Fig. 6e shows the pattern and the U template used for the determination of linear shrinkage. This casting was poured into a dry sand core mold. Fig. 6i shows the size sample upon which density determinations were made. This sample was cut from the lower half of the transverse test bar.

Samples for microstructure were taken from the 1¼ and 1½-inch section of the step bar poured in core sand and from the 1¼ and ⅜-inch machinability slabs poured in green sand.

Dilation test samples shown in Fig. 6j were made from a bar of the same size as the bar on which transverse tests were made. The dilatometer, shown in Fig. 9, consists of a furnace wound with three separate resistors to facilitate temperature control throughout the length of the sample. Dilation of the specimen is translated through suitable mechanism to a roll of paper wound around a drum which is turned by an automatic temperature recorder. The recorder is connected to the central couple of three themocouples inserted in a hole bored through the center of the test specimen having their junctions near the two ends and the center of the test bar respectively. Once having determined the setting of the rheostats controlling the current in the furnace resistors so that the temperature at all three points increases at the same rate, the record of temperature and dilation is obtained automatically.

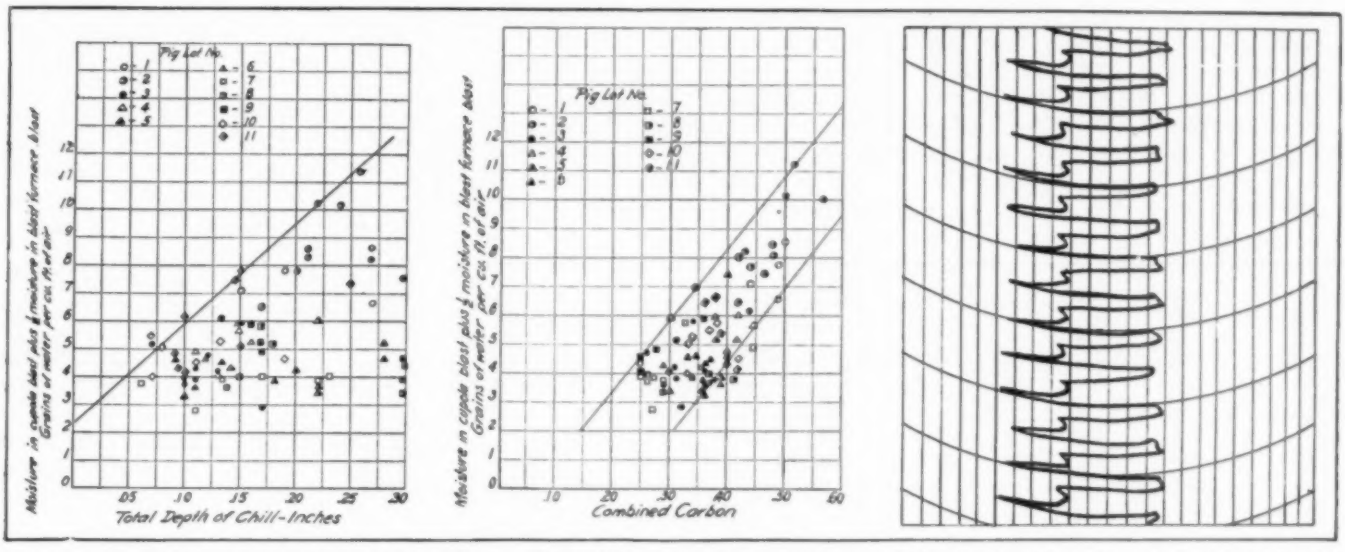


FIG. 10—RELATION BETWEEN DEPTH OF CHILL AND HUMIDITY OF BLAST. FIG. 11—COMBINED CARBON AS AFFECTED BY MOISTURE IN BLAST. FIG. 12—POWER CURVE OF MACHINABILITY TEST OBTAINED ON RECORDER SHOWN IN FIG. 8

After completing all the tests, a great deal of work was done to relate the test results with operating data. Curves were plotted between test results and values for operating circumstances which seem as though they should be related and also between values which seemed to have no relation.

All the graphs in which the plotted data showed some resemblance to a definite trend are shown. It is appreciated fully that each one of the tests made might have been developed to a greater degree of refinement, but had we done so, the thing we have tried to accomplish would have been postponed indefinitely, pending the ultimate refinement of each individual test.

We have assumed that an average obtained from a number of tests upon cast irons made from the same pig iron will give a result that is truly representative of that cast iron just as much as a highly refined test where every influencing factor is accurately controlled. After all, we are looking for the manner in which these different pig irons manifest themselves in production foundry results. Therefore, it is logical to

draw conclusions from the results obtained on test bars, the manufacture of which is attended by the conditions prevalent in a well controlled production foundry. These results have shown trends produced by certain causes. The sequel to this investigation should be one where the major causes of variation found in this work would be held constant, that the effect of some of the minor causes might be studied.

The depth of chill resulting from casting iron against a block of iron or steel usually is considered to be dependent upon the silicon and carbon content. The values obtained for depth of chill in this investigation were plotted against silicon content and also against silicon content plus carbon over 3.00 per cent, but the points gave no indication of a relation between chill depth and analysis within the range studied.

Depth of chill then was plotted against grains of moisture per cubic foot of cupola blast, plus one-half the moisture in the blast-furnace blast. The latter was added because 50 per cent of the cupola charge consisted of pig iron which was assumed to carry with it the chilling tendency if any caused by the presence of water in the blast of the furnace in which it was made. This relationship is shown in Fig. 10.

The conclusion to be derived from this graph is that high moisture content of the cupola blast produces a heavy chill. It also indicates that with low moisture content in the blast, other influences may act to produce a heavy chill. It is important to note that no low values for depth of chill were obtained when the moisture content was high. It is suspected that degree of oxidation of the pig iron in the blast furnace and of the gray iron in the cupola might be an important cause of formation of white iron, but this could not be studied, due to lack of suitable methods for determining presence of oxides. There are probably other influences which might cause a deep chill in spite of low moisture content in the blast. These other causes are responsible for failure of the points to lie on a single straight line.

It would seem logical to suppose that the amount of combined carbon present in cast iron might be determined and controlled by the same causes which affect the depth of the white iron layer produced when iron is cast against a chill. The amount of combined carbon was determined in the ⅝-inch thick machinability slab cast from each heat run in this investigation. These combined carbons were plotted against the grains of water per cubic foot of cupola blast, plus one-half the grains of water per cubic foot of blast furnace blast. The resulting graph is shown in Fig. 11. Where there are as many uncontrollable variables existing as have already been previously enumerated, it is not reasonable to expect the points defined by any two factors to lie close to a single line. For any given degree of blast humidity the combined carbon in the iron might vary between limits, depending possibly on degree of oxidation of iron, casting temperature, rate of cooling, silicon content, etc. Therefore the graph between combined carbon and blast humidity shows the points all falling in a band instead of along a single line. The occurrence of the points shows a trend from low combined carbon and low humidity to high combined carbon and high humidity. The width of the band signifies the potency of factors other than humidity to affect the combined carbon. Humidity apparently is the most important of the influences so we cannot determine how much these other factors affect combined carbon until we can control the humidity.

Table IV

Chemical Analysis of Pig Irons

Composition	Lot No. 1	2	3	4	5	6	7	8	9	10	11
T. C.	3.61	3.68	3.90	3.95	3.64	3.90	3.81	3.80	4.00	4.00	4.02
	3.90	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Mn	0.81	0.81	0.87	0.71	0.81	0.93	0.87	0.69	0.79	0.65	0.61
P	0.204	0.173	0.187	0.161	0.187	0.184	0.161	0.169	0.167	0.144	0.106
S	0.032	0.037	0.022	0.066	0.037	0.039	0.043	0.036	0.047	0.033	0.044
Si	2.50	2.50	2.45	2.34	2.59	2.44	2.70	2.50	2.33	2.63	2.42
	.....	.....	2.50	.....	2.41	.....	.....	.....	.....	.....	.....

Hold Safety Meeting

Safety engineering division of the Association of Iron and Steel Electical Engineers, met April 20, at the William Penn hotel, Pittsburgh. The meeting was held to study limit switches on overhead electric traveling cranes from four different phases, installation, inspection, operation, and maintenance. Harry Immel, director of inspection, department of labor and industry, Pennsylvania, was one of the speakers on the program.

Request Criticism of Coke Specification

At a recent meeting of subcommittee VIII on foundry coke specifications of committee D-5 of the American Society for Testing Materials held in Chicago, it was agreed that the new coke specifications should be based on a contract statement as to the several properties of the coke to be specified, and that the specification should contain only the tolerances that would apply to these properties mentioned in the contract. Tolerances proposed are as follow:

Ash—Five per cent of the specified ash content, plus 0.25 per cent ash.

Sulphur—Ten per cent of the specified sulphur content, plus 0.05 per cent sulphur.

Volatile Matter—Ten per cent of the specified volatile content, plus 0.10 per cent volatile.

Shatter Test—Tolerance 5 per cent flat.

Moisture—Limited to 3 per cent maximum in all cases; samples taken as loaded.

Porosity and fineness were considered, but porosity was believed by the committee to be of no special value in the specification, and it was not considered feasible to sample for fineness in the *as received* condition.

Combustion test was discussed at length. The committee is endeavoring to secure sufficient data on that test to justify including it in the specifications, as it seems to hold promise of considerable import in foundry coke testing.

To illustrate the working of the tolerances, a 10 per cent ash contract would allow a variation of 0.75 per cent ash, whereas a 7 per cent ash contract would allow only 0.60 per cent variation. A 1 per cent sulphur contract would allow 0.15 per cent sulphur variation whereas a 0.50 per cent sulphur contract would permit only 0.10 per cent variation.

The committee desires all criticisms from interested parties, and particularly wants records of tests and corroborative service tests. Communications on this proposed standard specification should be addressed to J. T. MacKenzie, chairman, subcommittee VIII on foundry coke specifications, American Cast Iron Pipe Co., 4300 Glenwood avenue, Birmingham, Ala.

American Delegation *Will See* Many Points of Interest

By Vincent Delport

European Manager, The Foundry

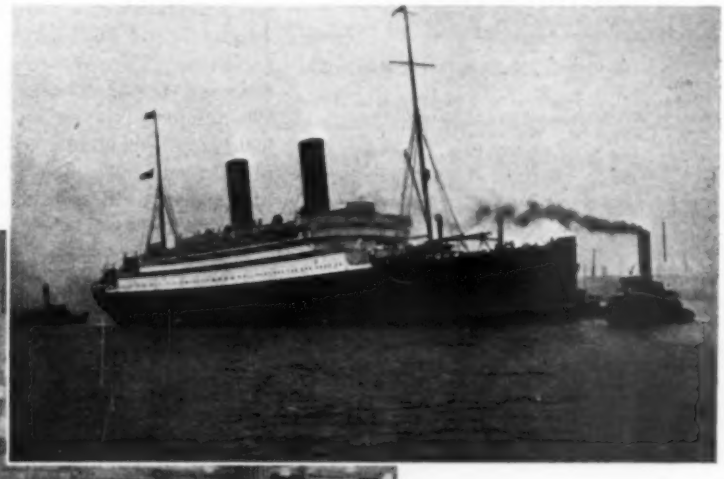
PREPARATIONS for the International Foundry congress that will be held in London in June now are entering upon an active period, and the various committees are at work arranging the final details of the program.

One of the features of the preconvention tour which will take place before the actual convention is held in London will be a visit to the Northeast coast exhibition at Newcastle-on-Tyne, which will be opened by the Prince of Wales on May 14. Excellent progress is being made with the construction of this exhibition, and the main buildings have all been completed. Only the finishing touches remain to be added.

The display of engineering will be one of the best ever seen under one roof outside of London. Leading firms of the Northeast coast have taken space to display their manufactures. These will be shown principally in the Palace of Engineering, and some heavy machinery already has been installed. This particular section of the exhibition includes an 82-ton diesel engine made by a Sunderland firm, and a 35-ton locomotive exhibited by a Newcastle-on-Tyne establishment. Other large machines are arriving daily.

A feature of the two main buildings, the Palace of Engineering and the Palace of Industries, will be the large number of working exhibits. These should interest visitors from all parts of Great Britain and foreign countries, as well as technical experts who are expected in large numbers. As an industrial exhibition it promises to be one of the most successful ever held in the provinces of England.

In addition to the foundries and works which will be visited during the preconvention tour, a list of which appeared in the Feb. 1 issue of THE FOUNDRY, visits will be paid during the convention week in London to the works of Dewrance & Co., Great Dover street, manufacturer of boiler mountings, valves, antifriction metals, and brass founders; Fraser & Chalmers, Erith, Kent, ironfounder and manufacturer of steam turbines, conveying and transporting plants, min-



Above—The S. S. Carmania which will sail May 10 with the first of the American delegation attending the Third International Foundrymen's Congress in London. Left—Dining Room of the Carmania

ing machinery, winding engines, etc.; J. & E. Hall, Ltd., Dartford, Kent, ironfounder and manufacturer of refrigerating machinery; and the United Glass Bottle Manufacturers, Ltd.

A number of prominent continental foundrymen are hoping that the American delegates to the congress will continue their trip after the congress and visit the continent, where they can be assured of a cordial reception. Those European foundrymen who visited the United States on the occasion of the second International Foundrymen's congress in Detroit in 1926 have not forgotten the reception that was accorded them by their American confreres, and American visitors may be assured of an opportunity for renewing friendships during their visit.

Included among the American delegation which will attend the London meeting are the following:

C. H. Gale, Grand Rapids, Mich.
L. W. Olson, Director, Past President, A. F. A., Ohio Brass Co., Mansfield, O.
Mrs. W. L. Olson.
S. W. Utley, Director, Past President, A. F. A., Detroit Steel Castings Co., Detroit, Mich.
Mrs. S. W. Utley.
Dan M. Avey, Editor, THE FOUNDRY, Cleveland.
Mrs. Dan M. Avey.
R. F. Harrington, Hunt-Spiller Mfg. Co., Boston.
C. E. Hoyt, Executive Secretary-Treasurer, A. F. A., Chicago.
Mrs. C. E. Hoyt.
James W. Gibney, W. P. Taylor Co., Buffalo.
George F. Snyder, Snyder Foundry Supply Co., Los Angeles.
Mrs. George F. Snyder.
E. M. Ayers, Ayers Mineral Co., Zanesville, O.
J. B. Goostray, Hunt-Spiller Mfg. Co., Boston.
George H. Wadsworth, Wadsworth Core Machine & Equipment Co., Akron, O.
Mrs. George H. Wadsworth.
E. L. Loges, Kramer Bros. Foundry Co., Dayton, O.
H. Cole Estep, Director, Chairman, A. F. A. Committee on International Relations, Penton Publishing Co., Cleveland.
Mrs. H. Cole Estep and Master Edward Estep.
Joseph F. Frogget, Penton Publishing Co., Cleveland.
A. E. Hageboeck, Director, Frank Foundries Corp., Moline, Ill.
Mrs. A. E. Hageboeck.
P. W. Mulder, Almont Mfg. Co., Almont, Mich.
Mrs. P. W. Mulder.
V. E. Minich, American Foundry Equipment Co., New York.
S. T. Johnston, President, S. Obermayer Co. and National Engineering Co., Chicago.
Mrs. S. T. Johnston.
R. E. Bryant, Jefferson Union Co., Lockport, N. Y.
Mrs. R. E. Bryant.
Fred Erb, President-elect, A. F. A., Erb-Joyce Foundry Co., Detroit.
Mrs. Fred Erb.
Wm. W. Paulson, Thomas Paulson & Son, Inc., Brooklyn, N. Y.
Mrs. Wm. W. Paulson.
Wm. J. Grede, Liberty Foundry, Inc., Wauwatosa, Wis.
Mrs. Wm. J. Grede.
E. N. Cabaniss, Joseph Dixon Crucible Co., Jersey City, N. J.
J. S. Law, Joseph Dixon Crucible Co., Jersey City, N. J.
R. E. Kennedy, Technical Secretary, Chicago.
James T. MacKenzie, American Cast Iron Pipe Co., Birmingham.
M. J. Evans, Whiting Corporation, Harvey, Ill.
Mrs. M. J. Evans.
Robert Crawford, Atlas Foundry Co., Detroit.
Mrs. Robert Crawford.
Miss Crawford.
R. W. McIlvaine, R. W. McIlvaine Co., Chicago.
Mrs. R. W. McIlvaine.
Edward Frohman, S. Obermayer Co., Pittsburgh.
Herbert Weaver, Canadian Foundry Supplies, Ltd., Montreal, Can.
Wm. H. Nicholls, Wm. H. Nicholls Co., Inc., Brooklyn, N. Y.
Robert J. Turnbull, Arcade Mfg. Co., Freeport, Ill.
John C. Pangborn, Pangborn Corp., Hagerstown, Md.
Frank Dodge, Werner G. Smith Co., Detroit.
Mrs. Frank Dodge.
H. B. Hanley, Whitehead Bros. Co., Rochester, N. Y.
Mrs. H. B. Hanley.
W. B. Willard, Grand Rapids, Mich.
Mrs. Kirk, Detroit.
F. R. Ringle, Herman Pneumatic Machine Co., Pittsburgh.
Thomas Kaveny, Jr., Herman Pneumatic Machine, Co., Pittsburgh.
H. A. Schwartz, National Malleable & Steel Castings Co., Cleveland.
Mrs. H. A. Schwartz.

Mexican Foundries Are Hindered by Rebels

Operations at the foundries of the Monterrey Iron & Steel Co., Monterrey, Mex., have been hindered because of the difficulty of obtaining furnace fuel. According to reports from Monterrey the rebels have disrupted the transportation facilities causing a shortage of fuel. Officials expect operations to be normalized within a few days.

Makes Safety Record

In recognition of the observance of safety by its employes, the general safety committee of the Whiting Corp., Harvey, Ill., recently arranged an entertainment, called the "Safety Jubilee," for the employes and their families. The Whiting Corp. at the time of the entertainment had over two months in which there was no lost time accidents. The plant employs about 600 men and women who are engaged in making various types of foundry and other equipment.

Visit Foundries

Students of the Ecole Superieure de Fonderie, Paris, France, spent part of their Easter holiday in visiting a number of important foundries and works under the guidance of E. V. Ronceray, director of studies, and M. Debar, one of the professors of the school. The first visit was to the Etablissements Guilliet Fils et Cie., Auxerre, the leading manufacturer of woodworking machinery in France. The visitors observed the method of molding castings up to 1¼ tons in green sand, and they also noted that in this foundry 99 per cent of the work is done with molding machines. Only one hand-molder is employed in the whole foundry.

Next the group visited the Henri Paul foundry, Etablissements Schneider, Mont Chamin. This plant is considered one of the largest foundries in Europe and the students were impressed particularly with the casting of turbine diaphragms. The manufacture of this casting presents special difficulties, as pouring has to be done at a definite, accurately controlled temperature. Turbine bodies weighing up to 40 tons are loam-molded. The bronze foundry, with an indirect arc, rolling type electric furnace, also was visited. Following the visit to the foundry, the students were taken to inspect the coke ovens, and they also inspected the open-hearth steelworks of the du Breuil works which contain three open-hearth furnaces of 40 tons capacity and five 70-ton furnaces. Various other shops and works of the Creusot plants also were visited, including a locomotive erecting shop.

Indexes Publications

The Engineering Index service, instituted in 1928, which indexes the contents of every issue of THE FOUNDRY and 1700 other publications in all languages as soon as they are published, is to be found in the public libraries of Newark, N. J., Cleveland, Bridgeport, Conn., Baltimore and the John Crerar library, Chicago. This service makes it convenient to trace various kinds of information with ease.

Decorates Buildings

Founders and consumers of aluminum alloy castings will be interested in a new publication issued by the Aluminum Co. of America, Pittsburgh, describing the use of aluminum alloy castings and wrought metal in architectural decoration. The booklet contains 30 pages showing the application of this material for ornamentation and its advantages. Illustrations include such buildings as the St. Louis courthouse; Standard Oil building, New York; Warren G. Harding memorial, Marion, O.; Koppers building, Pittsburgh, etc., and some of the castings that were employed in their decoration.

Extends Practice

According to a recent announcement by the division of simplified practice of the bureau of standards, the malleable foundry industry has extended simplified practice recommendation No. 79 for another year without change. Recommendation No. 79 deals with malleable foundry refractories, and copies of this bulletin may be obtained from the superintendent of documents, government printing office, Washington, for 10 cents.

The FOUNDRY Family Photograph Album

Upper Left

D. C. LLOYD

F. H. Lloyd & Co., Wednesbury, England

Lower Left

C. C. KAWIN

C. C. Kawin Co., Chicago

Upper Right

C. A. ANDERSON JR.

Pittsburgh Valve Foundry & Construction Co., Pittsburgh

Lower Right

FRED R. FARMER

Beardslee Chandelier Mfg. Co., Chicago

Payment will be made for all contributions on foundry and pattern shop practice suitable for publication

SCRAP METAL SPECIFICATIONS

(Concluded from Data Sheet No. 762)

FOR USE IN ELECTRIC FURNACES

Alloy steel scrap may be excluded from these specifications by mutual agreement between buyer and seller.

Punchings and Clippings

Punchings and clippings will consist of open-hearth steel punchings and clippings, ¼-inch and heavier, 4 inches and under in length. Not over 0.04 per cent in phosphorus or sulphur and suitable for shovel charging. Must be clean and free from galvanized or coated stock, dirt and excessive rust or corrosion.

Guaranteed Heavy Scrap

Guaranteed heavy scrap will consist of open-hearth steel plates, structural shapes, crop ends, shearings, broken steel tires, knuckles, tool steel and spring steel. To be not less than ¼-inch thick, other dimensions subject to agreement. Not over 0.04 per cent in phosphorus or sulphur, clean, free from excessive rust and corrosion, and contain no foreign material.

Unguaranteed Scrap

Unguaranteed scrap will consist of steel plate, shearings, nut and bolt punchings, short rails and other similar material, not less than ¼-inch in thickness and not over 12 inches in width or length. Not guaranteed under 0.04 per cent phosphorus or sulphur. To be suitable for hand charging. Must be free from galvanized and coated stock, foreign material and excessive rust or corrosion.

Guaranteed Axle Turnings

Guaranteed axle turnings will consist of heavy steel or iron axle or forge turnings, guaranteed not over 0.04 per cent in phosphorus or sulphur. To contain no foreign material and must be clean and free from excessive rust and corrosion. To weigh not less than 75 pounds per cubic foot.

Unguaranteed Turnings

Unguaranteed turnings will consist of short, heavy shoveling steel or wrought-iron turnings or rail chips, not guaranteed under 0.04 per cent in phosphorus or sulphur. To contain no foreign material and must be free from excessive rust or corrosion. To weigh not less than 75 pounds per cubic foot.

ALUMINUM BRONZE DATA

Aluminum bronze at its simplest is an alloy of 90 per cent copper with 10 per cent aluminum. A material of this composition has much the same properties as Swedish bessemer steel. It possesses a tensile strength of over 67,200 pounds per square inch with an elongation of 25 per cent in the sand cast state and has the unique property among bronzes of being susceptible to heat treatment within the same temperature range as steel, using much the same technique employed with steel, and offering much the same range of improved results. This is shown in Table I.

Varying the aluminum content between 5 and 11 per cent results in a range of properties, as shown in Table II.

Addition of small percentages of other metals, such as iron, nickel, manganese or lead, confers still further valuable physical or foundry properties,

Table I

AVERAGE VALUES OF ALUMINUM BRONZE

(Strauss)

Composition				Physical Properties					
Cu	Al	Fe	Condition	Prop limit lbs. per sq. inch	Yield point lbs. per sq. inch	Ultimate strength lbs. per sq. inch	Elongation % in 2 in.	Reduction area %	Brinell	Izod (a) impact (ft. lbs.)
90	10	—	Sand Cast.	11,000	25,000	72,000	22	22	95	22
90	10	—	Cast & H. T.*	27,000	48,000	90,000	8	10	175	....
90	10	—	Forged & H. T.*	35,000	53,000	95,000	6	10	190	14
89	10	1	Sand Cast.	12,000	27,000	74,000	24	24	95	25
89	10	1	Cast & H. T.*	31,000	54,000	90,000	10	12	175	....
86	10	4	Sand Cast.	17,000	32,000	81,000	18	18	....	....
86	10	4	Cast & H. T.*	35,000	58,000	98,000	10	12	....	....
86	10	4	Forged & H. T.*	47,000	70,000	103,000	8	12	210	10
88	9	3	Sand Cast.	17,000	31,000	77,000	44	36	110	25
88	9	3	Chill Cast.	17,000	31,000	79,000	48	40	110	45
88	9	3	Cast & H. T.*	24,000	40,000	84,000	30	25	125	38
88	9	3	Forged	18,000	33,000	85,000	42	47	130	35
			Forged & H. T.**	26,000	50,000	88,000	32	30	135	30

*Sections about 1½-inch. **Sections about ¾-inch. (a) Mesnager notch 2 mm. dia. and 2 mm. deep.

opening up fields of utility in widely divided spheres of industry as may be seen in Table III.

Aluminum bronze as an engineering material has many latent possibilities. In it the designer has a medium available in all cast or worked forms, offering a choice between an elongation figure of 78 per cent with relatively low yield and tensile strength, or a brinell hardness of 260 with comparatively low ductility and a high elastic limit.

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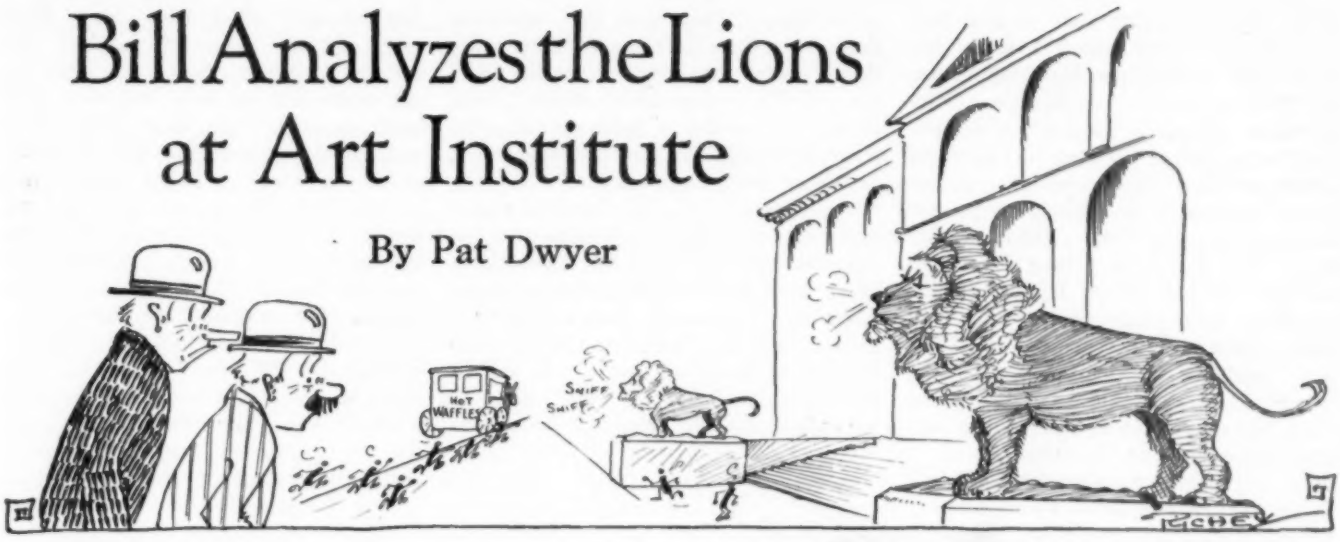
(Continued on Data Sheet No. 765)

Bill Analyzes the Lions at Art Institute

By Pat Dwyer



THE other day in Chicago I decided a little exercise was necessary to keep the old frame in the pink. The spectacle of large, over stuffed citizens of both sexes lolling in fat, over stuffed chairs made me realize that the same fate might overtake me, if I yielded to temptation. Casting about in my mind for a suitable form of violent exercise I debated the relative merits of spending half an hour in one of the elevators, or of going forth for a long invigorating walk. I stood an even chance of bumping and jostling an equal number of human beings in the elevator or on the street, and I probably would travel an equal distance whether I moved vertically or horizontally.

'Twas a nice point and worthy of serious consideration. I curled up in a nice comfortable chair and smoked two fair pipefuls of tobacco while considering the relative merits of the two plans. No good ever comes from jumping to conclusions to hastily.

Before I finally arrived at a decision I was alarmed to find that a third alternative persisted in suggesting itself for my attention. I was a free agent. Why should I kill myself by adopting either of the first two plans, when I could remain comfortably where I was? Naturally I immediately recognized this as the insidious voice of the tempter always on hand when noble resolutions are to the fore. The question then resolved itself into whether I should succumb weakly to the siren voice of the tempter with a consequent loss of self respect, or sternly bid Satan get behind me, pull my hat down firmly over one eye and boldly step out for a hike of an unlimited number of miles. The solution of this perplexing problem which bade fair to occupy my mind for the remainder of the afternoon, was taken out of my hands by Bill who hailed me from across the lobby, I waved the signal of distress and beckoned him to approach.

"Snap out of that nest," he said, "and come for a walk with me down the avenue, known hereabouts to all and sundry as the Boul' Mich. I have not been out of this dump since we arrived and I want to give the old dogs a run. You need the exercise more than I do. If you park in that chair much longer you will have to call a bell boy with a lift truck to carry you off to bed. At the present moment you look—and I bet you feel—like Mark Twain's famous jumping frog of Caleveras county, after the guiless stranger had poured a handful of buckshot into its capacious maw."

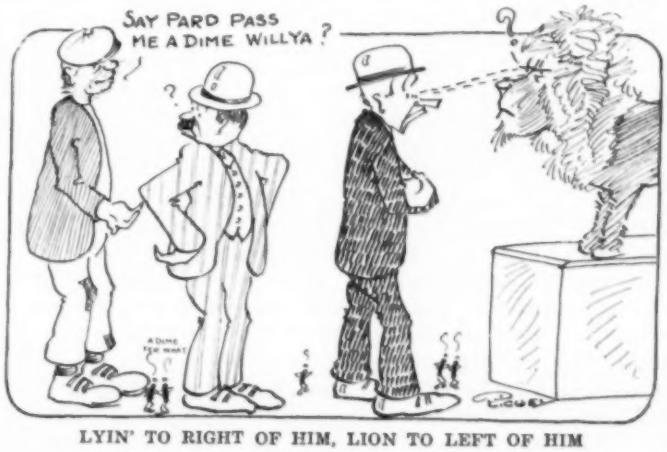
"On the contrary," I lied to Bill boldly, but I am afraid unconvincingly, "on the contrary, my brave bully boy, I was on the point of stepping out when you appeared. I was all set, poised for flight you might say and only waiting for a suitable companion."

"Poised for flight, hey?" Bill jeered, "you must be one of these here now phillyloo birds that fly backward in their sleep! Try another poise, this time with your eyes open and your feet on the floor. Alleeoop! Let's go!"

A mild, and I claim, a perfectly logical suggestion on my part that we take a taxi, was laughed to scorn. I pointed out that we could cover a vastly greater distance in any given length of time. We owed it to ourselves to see as much of the city as possible during our brief sojourn. Here were cabs without number ready, nay anxious to whisk us away.

"Whisk is good," Bill replied, "One of these whiskey birds is apt to whisk you away so far, you'll never come back. Besides I saw all of this town I want to see in the panic of '03 when I walked all over it looking for a job. I did not do much exploring inside the Loop or up along the Gold Coast, but I dragged the old feet over most of the remaining streets of the town. No mariner cast away on a desert isle watched for a sail on the horizon as eagerly as I sought for the top of a cupola peeping above the roof of a building. Those were lean days, me lad.

"Sight seeing is a grand occupation when your paunch is filled comfortably and you have a handful of ducats to jingle in your breeches pocket, but it seems to lose all the rosy glamor when the pockets are empty, when the soles of your shoes are worn through, when you have to depend on the free lunch counters and when the old clothes men begin to eye you appraisingly and follow you around. That reminds me," said Bill with a grin, "of a little anecdote I heard from a lad at the hotel yesterday. He claimed he was present when the



LYIN' TO RIGHT OF HIM, LION TO LEFT OF HIM

thing happened, but that is one feature of any story which I never believe. He said he was standing on the sidewalk of a little narrow, one way street in his home town when a junkman approached driving a rack of bones attached to a rickety wagon piled high with a miscellaneous collection. An impatient citizen driving a car that had seen better days—lots of 'em—trailed along behind. This hurry-up guy made the welkin ring with a peculiarly atrocious horn. After one particularly vicious blast, the junkman brought his prancing steed to a full stop. He turned in his seat and yelled back to the irate driver: 'Hay! ya dummy. Can't ya see I'm filled up? I'll come back and get it tomorrow!'" We had strolled along while Bill, with suitable gestures, was relating this charming little *bon mot* and now found ourselves in front of the Art Institute. The two immense bronze lions guarding the entrance attracted Bill's attention. He insisted on examining them from the ferocious, open mouth to the tuft on the end of the tail.

HE CAN BE PUSHED JUST SO FAR

"Grand pieces of work," he commented. "I wonder if each of these figures was cast in one piece, or if a number of pieces were cast separately and then assembled."

"Write to the *Tribune* about it," I suggested. "You probably will get an answer to the effect that huge masses of metal were melted in the big Chicago fire. After the shouting and the tumult died and the ashes were cleared away, these animals were found in the condition you now see them. The only feature that surprises me is that some enterprising lad has not pinched them long ago and reduced them to salable ingots. They must be anchored down pretty solidly. In the old days the job would have presented quite a problem, but with all the modern tools and methods which science has placed at the disposal of the burgling profession, the job would be a walk-away (Joke, Ha, ha!)."

"That lets you out," said Bill. "I thought that you were thinking of tackling the job, but if there is any walking to be done, I know you will pass it up. However, all this piffle does not throw any light on how these animals were made. Another point I should like to have settled is why one lion's tail curls away in a wide sweeping gesture to the north while the tail of the other lad points to the south. In other words, my boy, these lions are crooked."

"Probably," I said, "these are political lions. They were nice, innocent lions when they left the foundry with their tails hanging straight and plumb. Their present condition is due to consorting for a long period with a crooked political administration.

"This merely is a suggestion. I am not advancing it as an absolute statement of fact. My knowledge of Chicago politics is limited and based solely on what I have read in the papers. Long ago I learned that newspapers have a habit of boasting about every feature of the old home town and in the orgy of wickedness that seems to pervade every big city, it is only natural to assume that the local papers with a kind of perverted pride, play up some of the doings of the crooked element.

"However, as I said, that is only a hypothesis. A much more plausible theory is that the shape of the lions is due to climatic conditions. You often have heard the expression, 'Its cold enough to freeze a brass monkey.' If that is true of a comparatively small animal like a monkey, how much more accurately the expression might apply to one of these huge bronze figures, exposing, as it does, so much more area to the piercing north or east wind that blows in from the lake in winter. The only flaw in the theory is that the tails are in a fairly extended position, when they should be curled in between the hind legs. That would give the molder something to think about.

"On the other hand, as you might say, the theory is not too far fetched. For all you know to the contrary, the tails may have been curled around the feet all winter and only recently, in response to the balmy airs of Spring, have started on the return journey to their usual jaunty position. I should not be surprised to learn that in summer they assume a position approximately 37 degrees above the horizontal.

"The pained expression on the animals' faces," I continued, warming to the subject, "might be due to the fact that recently they have been given their annual dose of sulphur and molasses, or sassafras tea. How do you know, for example, but some jolly bootlegger on his way home from some innocent diversion, has poured a gallon or two of hooch down their throats? To the honest, unbiased and inquiring mind approaching the problem in the true scientific spirit, forty possible explanations present themselves. For example consider—"

"Consider yourself all wet," Bill interrupted. "If you want to know what makes these lions look so sour, I'll tell you. Its because they are fastened down and have to listen to a silly magpie talking nonsense. That's what's wrong with 'em. If one of 'em turned around right now and offered to bite you, I wouldn't raise a finger. My sympathies all would be with the lion. He'd probably die in great agony from ptomaine poisoning or gastric ulcers in the stomach." "Just for that," I said, "I have a mind to let you sizzle in the grease of your own ignorance. By the rarest good fortune last night I learned exactly how these lion's tails were twisted. I only advanced the various theories to discover how much or how little you knew. I fully intended to tell you but now—"

"Now you are going to, eh?" Bill inquired, skeptically. "I suppose you are going to tell me that the night gang shook 'em out while they were too hot and bent 'em!"

"No," I said. "They were shaken out all right, cleaned, polished and set up in front of the Art Institute, with their tails, both alike, sticking out bravely behind them, like the tails of little Bo-Peep's sheep."

"A fat lot you know about sheep," Bill commented. "Say! Is this a fairy story or just a lot of baloney? Where did you get it?"

"As you were," I said. "In other words shut your mouth and open those doglike appendages that hang on either side of your conk and I'll tell you something to make you honk! Poetry, my boy, poetry. Its a gift. Comes natural without any effort."

"God help all poor sailors on a night like this." Bill shook his head sadly. "It's a pity you were not drowned when you were a pup. If you don't know any more about this job than you know about poetry, you may consider this session closed right now."

"Did you ever hear of the wise old owl who lived in the oak?" I asked meaningly. "The less he spoke the

more he heard. That's why he was called a wise old bird. Listen. Last night while I was engaged in my favorite occupation of window shopping, a dilapidated looking lad sidled up alongside me and gently suggested that I should slip him a small donation. His pronounced brogue led me to ask him how long ago he had left the land of his birth. He sized me up and then apparently satisfied, he confided in me that 'Afther th' Aisther risin' some years ago he wasn't exactly popular wit' th' Black-an'-Tans, bad luck to 'm, so he had hooked it and wint to say.' In proof of his assertion he opened his shirt and showed me a noble mermaid gallantly done in vermilion and blue, reposing on his chest. He had sailed deep water for several years, but the prevalence of the British ensign rather irked his spirit. About a year ago he jumped his ship in Baltimore and had traveled inland with the idea of shipping on the Lakes. He was waiting now for navigation to open, but in the meantime he was financially embarrassed. If I could slip him now—say—two bits, sure yer honor'd never miss it—" "I hope you gave it to him," said Bill. "Probably he was just a bum but you never can tell. Any how forget it. It has nothing to do with these lions."

"On the contrary," I said. "It has everything to do with it. This exiled patriot cleared up the mystery. Instead of slouching away after the two bits had changed hands, he launched into a comparison of industrial conditions here and in the old country. He is a great admirer of big Bill Thompson and is in full accord with that gentleman's views on the Anglo-American question.

" 'There's a man afther me own heart,' he said. 'Ye know thim two big brass lions down there forninst th' Art Instichute? Wan day some wan towld Bill they wor th' dead spit an' image iv th' lions that gards the Trafflegar monyoumint in London. Bill jumps out iv his sate up there in the city hall and bounces down to th' Art Instichute. He grabs the lions' tails and gives 'em a twist an' there they are to this day, if ya want to go look at 'em!' "

"The only thing that surprises me," said Bill, "is that he did not sell 'em to you—and get away with it. To save you from further humiliation, I'll give you the low down on these figures. They were designed and modeled by Joseph Kemys and were molded and cast by Jules Berchem in his American Art Bronze Foundry over on Lake Ave. in 1894. The models were cut into several pieces for ease of manipulation and were molded in French sand by the *piece mold* process. The tails were molded from separate patterns and that accounts for their shape. Afterward the various parts were assembled so cunningly that no joints are visible.

"Naturally on account of the limited amount of this kind of work, knowledge of the process is not so widespread as that pertaining to other branches of the foundry industry. I had an inquiry recently from a man who had an extremely complicated casting to make. He was thinking of employing the lost wax process and said he would appreciate any information I could give him on this process for making castings.

SOME PEOPLE ARE NOSEY

"Manufacture of castings by the so-called *lost wax* or *cire perdu* process is an art practiced only by highly skilled men with years of training. From the letter head I noted he operated an iron foundry and naturally I assumed he was thinking of making an iron casting. Of course, this kind of complicated the situation. So far as I know the lost wax process has been applied only to the production of nonferrous castings. With the exception of a few interesting examples made by a west coast foundryman a few years ago and described and illustrated in THE FOUNDRY, July 1, 1919, I know of no iron castings made by the lost wax process in this country.

"Even in the production of statuary and other complicated and intricate nonferrous castings, the *piece mold* method is used a great deal more extensively than the lost wax method. I believe the lost wax method for making nonferrous castings is practiced quite extensively in some European countries. Also in the Orient where it is in the hands of highly skilled men with centuries of tradition in the preparation of the materials and methods of application. Also where the element of time is not rated as highly as it is on this side of the Atlantic.

"Any person attempting one of these jobs for the first time, certainly is due for a series of disappointments before he succeeds. At various times the technical press has presented articles on the lost wax process. Naturally sand cannot be rammed against a yielding wax face. The mold is made from a plaster mixture that can be applied like loam. This material is not sufficiently refractory for an iron casting. It will stick to the face of the casting in the shape of a universal scab. Fairly extended reference to methods practiced in statuary foundries may be found in the bound volumes of several magazines in any big city library. Specifically I suggested issues of THE FOUNDRY for February, 1911, June 1 and July 1, 1919. Comparatively recently descriptions of methods practiced in a famous eastern statuary foundry have appeared in the April 1 and June 1, 1927 issues. In closing I warned him that unless he had some particular and compelling reason for attempting the casting according to the lost wax process he should pass the job.

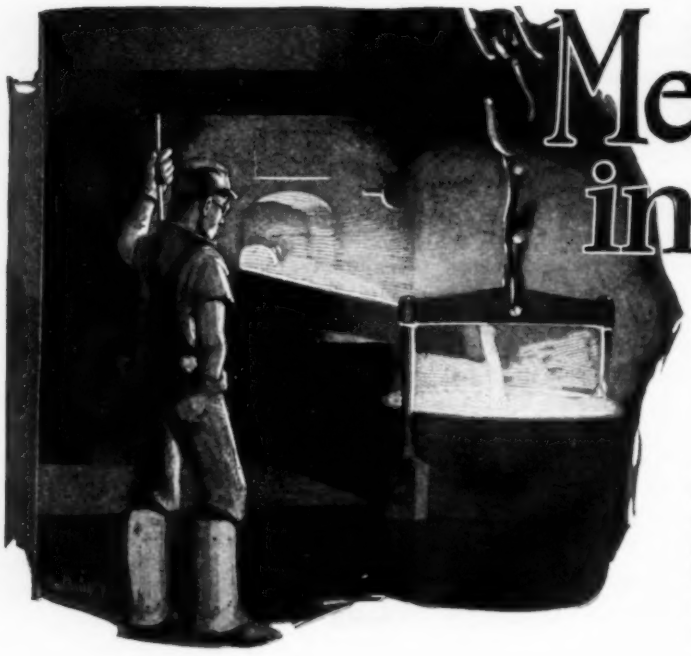
"Talking about ready made answers, I heard the best of the season yesterday. A little girl went to school with her coat hooked crooked. The teacher in helping her to remove it said, 'Did your mother hook this coat, Lillian?' 'I should say not,' says literal minded Lillian. 'She bought it at one of the sales, and I don't think she will be pleased when I tell her what you asked me."

Wisconsin Group Meets

The regular April meeting of the Wisconsin Gray Iron group was held April 2, at the Hotel Schroeder, Milwaukee. Louis Rasmussen, general manager, Nash Motors Co., Kenosha, Wis., was the speaker of the evening. He spoke on, "How We Make Castings At Nash Motors".

Offers Graduate Work

The University of Illinois will appoint 16 men to research graduate assistantships in the spring. These assistantships consist of appointment for 2 years and at the completion of the period the appointee is eligible for a master of science degree. Further information may be obtained by addressing the director, Engineering Experiment station, University of Illinois, Urbana, Ill.



Melting Iron in the Cupola

By J.E.Hurst

Part XVII

DIRECT reading pressure gages of the Aneroid and Bourdon type also are used and these principles are embodied in the production of recording pressure gages. These need considerably less attention in use but they are more expensive. Figs. 110, 111 and 112 respectively are typical of the direct reading and recording dial type pressure gages. The direct reading gage contains no liquid. The back portion of the metal case forms a chamber closed by a spring controlled diaphragm. A short tube from this chamber is connected by a length of tubing to a small diameter pipe leading to the position where the pressure is to be measured and the front is open to atmospheric pressure. The diaphragm is connected by a rack and pinion movement to a pointer which moves over a graduated dial.

Recording dial type instruments utilize the familiar Bourdon tube connected to a union by which it can be attached to a copper tube leading from the position in which the pressure is to be measured. Movements of the Bourdon tube are communicated to a pin arm moving over a flat circular chart, rotated by clockwork. The chart performs one revolution in 24 hours or in 7 days as desired. A pen lifting device automatically holds the pen clear of the chart when the case is opened. The charts, of course, are constructed with circular co-ordinates.

Flowing air conditions and influence of various factors on these conditions are understood sufficiently to warrant construction of measuring instruments sufficiently reliable for industrial purposes. Experiment has shown that the flow of gaseous fluids as a whole presents a problem of considerable complexity. One that is influenced by numerous conditions including nature of the fluid, and the shape and character of the channels in which the fluid is flowing. Conditions under which measurement of the quantity of flow is desired, must be carefully defined. Various methods of measurement adopted are not universally applicable over all conditions and ranges of flow.

Quite a large number of different principles are utilized in the design of many types of available air volume meters, but only a few have been adopted in measurement of cupola air supply. The three main principles adopted in cupola air meters follow: (1) Measurement of velocity at a point in the cross sec-

Uses Instruments

A DIVERSIFIED line of instruments for indicating and recording the pressure and volume of blast supplied to the cupola has been developed in recent years. With these instruments to assist him the cupola operator is in a position to check the operation of the furnace closely and to detect and remedy unfavorable conditions before they go too far. Interesting features in the construction, operation and method of application of all the devices now in use are presented for the edification and information of foundrymen.

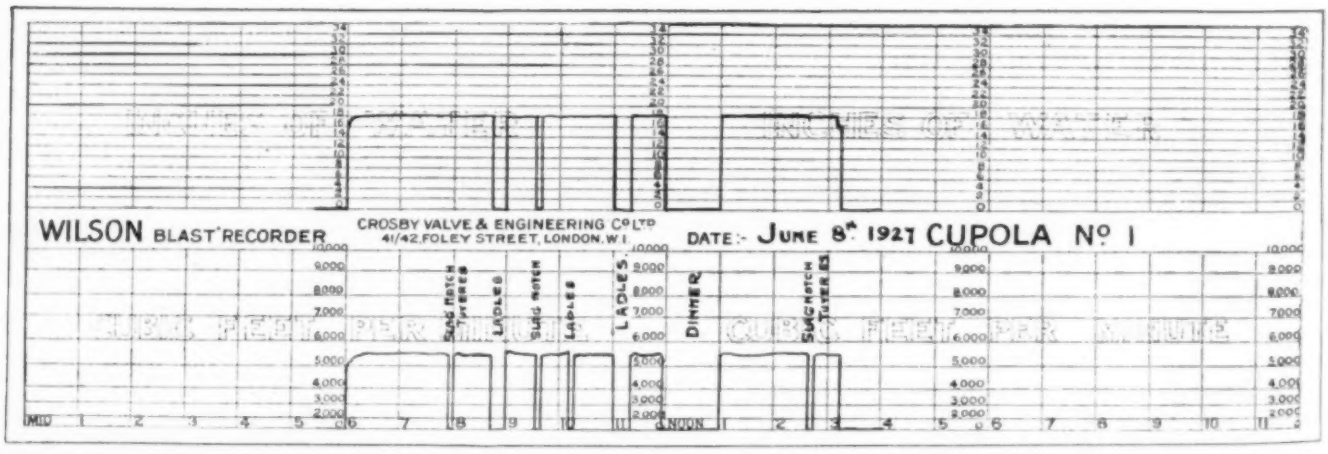


FIG. 109—BLAST RECORDER CHART FROM AN AVERAGE DAY'S HEAT TYPICAL OF GOOD PRACTICE

tion of the stream. This method is embodied in the various pitot tube meters. (2) Measurement of drop in pressure due to an obstruction placed in the air stream, a method exemplified in the various venturi and orifice meters. (3) A weight controlled paddle placed in the air stream, illustrated in the Wilson-Crosby volume meter, shown in Fig. 121.

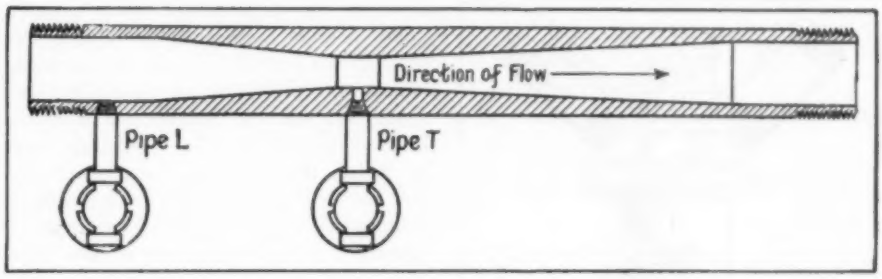


FIG. 118—SECTIONAL VIEW OF VENTURI TUBE

Meters based on any of these three systems vary considerably in the methods in which results are rendered visible or transferred to the recording mechanism. It is neither necessary nor possible to describe every type of meter in a work of this kind. Description of the principles embodied in each of the three types of meters, with typical illustrations of industrial instruments will be sufficient.

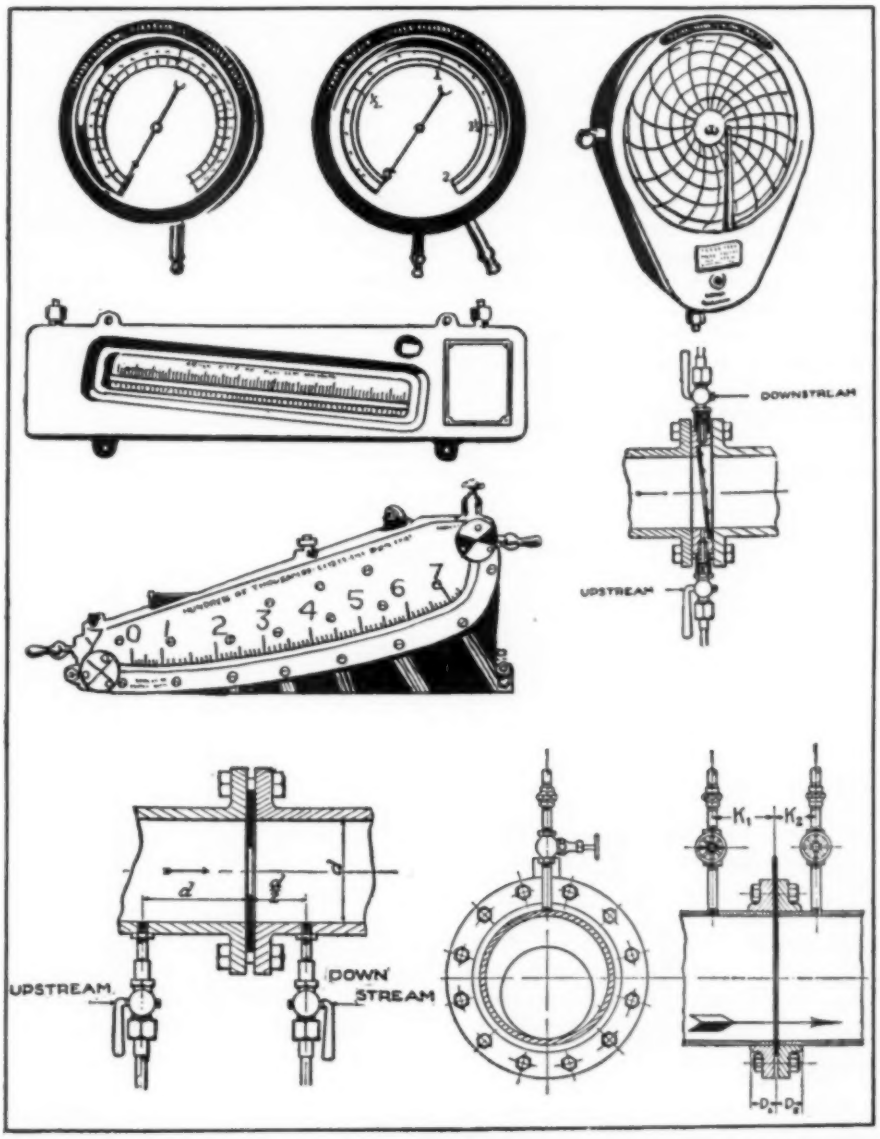
Measurement of velocity at a point in the cross section of the air supply is carried out conveniently by a pitot tube. This device is convenient for industrial use, where it is inserted in a hole drilled and tapped in the blast pipe. Connections to the gage are made by flexible tubing. Under laboratory conditions, measurements can be obtained to a high degree of accuracy. A pitot tube consists of two parts, a dynamic tube pointing up-stream, parallel to the current of air, which determines the sum of the velocity and static pressures, and a static tube by which the static pressure alone is determined. The patterns illustrated are the result of experiments at the National physical laboratory.

Two brass tubes are arranged concentrically. The inner, or dynamic tube, has a thin-lipped orifice protected by a plug when not in use. The outer, or static tube has a conical stopped end with small holes drilled perpendicular to the axis below the cone. Difference in pressure between the two tubes, is proportional to the square of the velocity of the flow of gas. Fig. 122, left, shows a pitot tube for industrial use, fitted with a screwed gland by which it may be fixed in the pipe and adjusted for pipes of different diameters. Sometimes the screwed gland functions as a universal joint. Fig. 122, right, shows the standard laboratory pattern suitable for immersion up to about 13 inches (33 centimeters).

Difference in pressure between the two tubes may be measured in the simplest manner by a liquid manometer U tube in which one leg of the manometer is connected to the inner and one to the outer tube. Under normal conditions this difference is slight. Accuracy in reading the pressure differences is increased by special manometer tubes, typified by the inclined and the curved types indicated in Figs. 113 and 115.

An ingenious adaptation of the manometer to continuous records is illustrated in Fig. 120. Two liquid containing vessels connected underneath are balanced on a knife edge and one of the differential pressures to be dealt with is introduced into each vessel by a flexible tube. Difference in pressure so introduced causes the liquid to shift from one vessel to the other, thus altering the center of gravity of the apparatus and causing the pen and the pointer to move across the chart and scale respectively.

In another hydrostatic type of recorder illustrated in Fig. 119 the recording pen arm is controlled by the vertical movement of a float, which rises and falls with variations of



FIGS. 110, 111, 112—DIRECT READING, DIFFERENTIAL AND RECORDING PRESSURE GAGES. FIGS. 113 AND 115—INCLINED TUBE AND CURVED TUBE MANOMETERS. FIGS. 114, 116 AND 117—VARIOUS TYPES OF ORIFICE PLATES

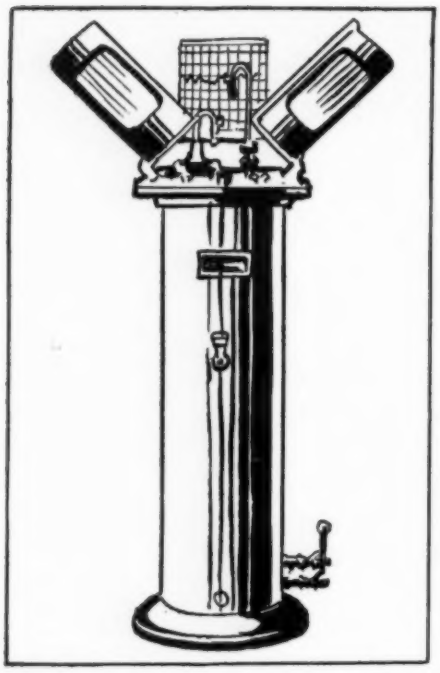


FIG. 119—BLAST RECORDER FOR INDICATING PRESSURE AND VOLUME

pressure. The pen traces the records in rectangular co-ordinates upon the chart wound around a clock driven drum. A differential dial gage of the diaphragm type, exactly similar in appearance to that illustrated in Fig. 110 may be used. The diaphragm is not exposed to the atmosphere on the front side. It is connected to the second limb of the pitot tube and the movements of the diaphragm thus are actuated by the differential pressure. Graduation of the scales is effected by calibration of the instrument under standard conditions, and usually read directly in cubic feet per minute.

To insure accuracy the pitot tube should be installed in a straight length of pipe free from eddy currents set up by bends and corners. Preferably the length of straight pipe in which the tube is installed should not be less than 6 feet. The tube is inserted a distance equal to approximately 1/3 the diameter of the pipe.

Venturi Tube Features

The venturi tube shown in Fig. 118 consists of a pipe tapered internally from both ends to form a small orifice near the center. This obstruction to the passage of air causes a drop in pressure at this point from the normal pressure existing in the main. The drop in pressure is caused by the increase in velocity and a measurement of the pressure difference between that of the main stream and that at the throat of the venturi tube determines the velocity or quantity of air passing.

Pressure differences are measured by instruments similar to those already described in connection with the pitot tube. The pressure differences in the venturi tube may exceed those in the pitot tube. Therefore, more robust measuring instruments may be employed to obtain greater accuracy of measurement. Proportions of the tube are determined by the measuring apparatus used. Tubes of correct proportions are supplied by makers of the instruments. Meters are calibrated to read in cubic feet per minute.

In principle the orifice plates shown

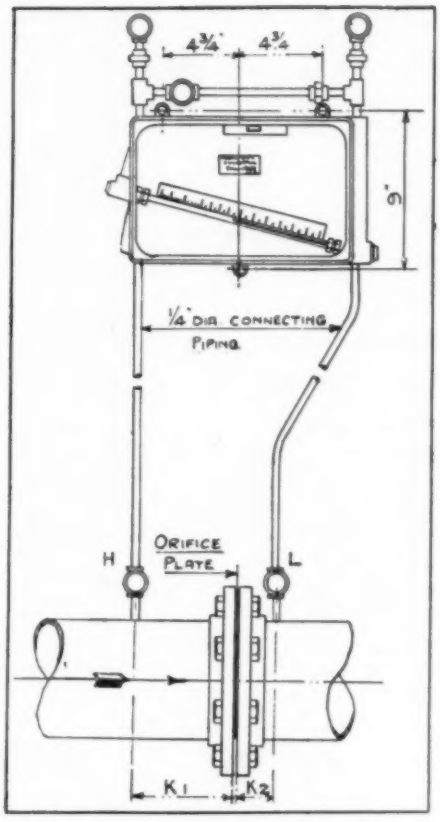


FIG. 123—DIAGRAM SHOWING ARRANGEMENT OF ORIFICE PLATE AND MANOMETER

in Figs. 114, 116 and 117 are similar to that of the venturi tube. Pressure difference created by the insertion of a plate obstruction containing an orifice of smaller diameter than the bore of the pipe is measured. Throttling the air flow in this manner

(*Concluded on Page* 405)

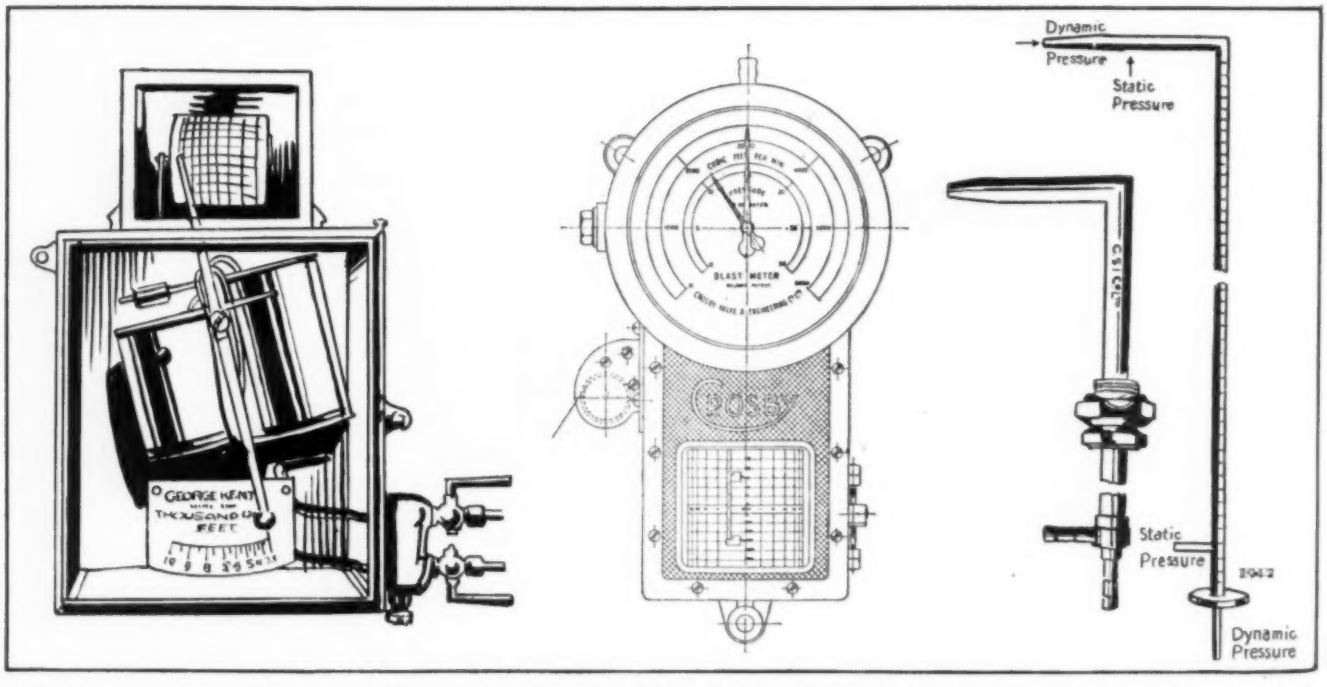


FIG. 120—BALANCED MANOMETER RECORDER. FIG. 121—THE WILSON-CROSBY BLAST RECORDING INSTRUMENT. FIG. 122—PITOT TUBES INDICATE STATIC AND DYNAMIC PRESSURES

TEACHING APPRENTICES Is His Hobby

PAUL R. RAMP
—has had charge of many shops

ACCORDING to Paul R. Ramp's own statement, given voluntarily and without threats, intimidation, duress or coercion of any kind, members of the Ramp family, for the past 200 years, have been foundrymen in England and in these United States of America.

Well now, you may ask, just whereabouts in these United States of America do you mean? To which answer, particularly in Paul's case is: Everywhere, or just about that, if you get our meaning.

Before the 200-year mark of course, the official records begin to fade out and consequently are a trifle difficult to trace. That is only a trifling detail. A well established tradition in the family claims that the first Ramp was a loam molder with Hiram of Tyre. The name was conferred upon him with sundry other marks of favor for the ingenuity he displayed in building a ramp on which the bronze columns for the temple were taken out of the pit, through the cleaning room and later through the streets of the city to the site of the temple at Jubilee and Judah streets.

Owing to the somewhat hazy character of the official records—the early Ramps were handier with the foundry tools than they were with the pen—opinion is divided to some extent on whether the first Ramp came to England in the train of William the Conqueror, or came at a later date as armor maker and repairer to Richard of the lion heart on the return of that scrappy gent from one of the numerous forays he conducted personally in and around the Holy land. The fact that Richard's shield bore a device of a lion *rampant* seems to lend credence to the theory that his armorer was a man of parts, with a nice regard for his own skill and a natural desire to secure a proper measure of publicity for the old family name.

Paul's grandfather, Henry, came to New York about the middle of the past century and is credited with having turned out some real nifty jobs in the way of intricate and difficult castings. Among others, it is said, he made the first jacketed pot for Mr. Cooper—of course you remember *the* Mr. Cooper—known to all and sundry in his day as the Glue King.

Grandfather Ramp taught his son J. B., all the confidential inside stuff pertaining to the making of molds and the melting of suitable metals wherewith to fill them. The son, J. B., had what they call a bit of a wandering foot which brought him to Youngstown, O., in time to welcome the arrival of *his* son Paul, early in the month of April—to be exact, on the seventh—1879.

Later J. B. Ramp assumed charge of the Murray Iron Works, Burlington, Ia., and when Paul arrived at a suitable age for the—er—sacrifice—his father took him in as an apprentice and proceeded to teach him the trade in a manner designed to reflect credit on the family name. Testimony to the skill of the father as a foundryman and of his ability to impart instructions—perhaps to some extent also, to the receptiveness of the subject—is found in the fact that Paul left the old home nest at the age of 21 and assumed charge of a foundry in the distant state of Pennsylvania.

He has had charge of many shops since that time and has had a wider and more varied experience than falls to the lot of most men. At one time or another he has been superintendent or manager of foundries engaged in the manufacture of castings for railroads, agriculture, locomotives, machine tools, pumps, tractors, steam engines, textile machinery and marine service.

In many respects his career resembles that of the famous character Charcoal Bill who figured prominently in the advertising pages of THE FOUNDRY for a considerable period. Like Bill, he tackled a new and hard job with the greatest enthusiasm, but after he had it tamed and eating out of his hand, his interest slowed down and he commenced to look around for another hard nut to crack. This characteristic probably is a throwback to a remote ancestor who lived at a period when young gents, armed with long spears, went forth to slay fire breathing dragons for the honor and glory of fair demoiselles and incidentally because all the boys in the Who-Who—or was it the Coo-Coo class?—were doing the same thing.

Practically from the beginning of his career as an active foundryman, he has contributed freely to the technical press over a wide range of features that characterized the many foundries under his direction. At the Detroit convention in 1926, he presented a paper on the work he is doing with apprentices in the plant of the Newport News Shipbuilding & Dry Dock Co., Newport News, Va., where he has had charge of the foundry and pattern shop for the past four years. Paul has several hobbies, but gets his greatest kick out of developing young molders out of the raw material. "Ketch 'em young," he says, "Treat 'em kindly and tell 'em everything." Can he tell 'em? And How!

Awards Three Prizes

The National Engineering Co., Chicago, conducted a contest during the Chicago convention of the American Foundrymen's association and awarded one laboratory size sand mixer and two traveling bags. The mixer was won by the Hart-Parr Co., Charles City, Ia. The first traveling bag was won by A. A. Stiehl, superintendent of maintenance of that company, and the second bag was won by C. M. Mueller, treasurer of the Universal Foundry Co., Oshkosh, Wis.

The Shakeout

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FRANK G. STEINEBACH, Managing Editor
CHARLES VICKERS, Nonferrous Editor
NORMAN F. HINDLE, Assistant Editor

¶ Keeping in Style

GENERALITIES easily are drawn. They sound plausible if not subjected to a too close scrutiny and for that reason they are accepted as nuggets of wisdom by those who hear them or see them for the first time on the printed page. In a pamphlet issued recently, the statement is made that women constitute the real vanguard of progress. Their insatiable desire for a change, for something new is responsible for the advancement of the human race. This statement then is elaborated to prove that if women had the conduct of industrial affairs they would make a clean sweep of methods, equipment and rigging at least once and maybe twice a year. Every plant would be *chic* and up to the minute.

THE only fallacy in this argument, trifling it is true, but still a fallacy, is that the money spent by the man in the plant and that spent by the woman in the home are spent from two decidedly opposite viewpoints and for two widely different purposes. The man spends money in his plant for new equipment on the distinct understanding, or at least with the reasonable hope that the equipment will earn more money and thus pay for itself, leaving a more or less handsome surplus to reward the man for his acumen and foresight. In other words when he buys equipment he figures he is only lending his money out at a good rate of interest. When a woman buys a hat, an antique rocker or a new car, it is bought directly from capital and yields no return.

SOME foundrymen display a certain amount of reluctance in changing methods or in adopting new equipment, but the majority are keeping abreast of the times and are just as keen about cutting financial corners as the men engaged in any other industry. They do not favor the idea of throwing a machine away because it is slightly soiled, but if they discover a second machine that will cut their costs they will scrap one and adopt the other as readily and willingly as their wives discard the winter bonnets at Easter in favor of more gorgeous and colorful creations.

¶ Observe Cash Discounts

ANY foundry selling castings usually contracts to give the buyer a certain per cent discount for cash paid within 10 days or 30 days net. If the buyer places his order under these clearly defined conditions and then proceeds to change the terms of the contract to suit himself, he should be called to account. Some purchasers assume the attitude that the company with which he is dealing would rather lose the discount than lose the patronage. Fundamentally, all companies are in business to make money. When a buyer takes an unjust advantage of a discount he is taking what is not justly due him and is taking profits from the producer. Big or small, the consumer should be made to pay the seller what is due him, according to the contract if the purchaser should fail to take advantage of the time limit in the discount clause of the agreement.

CASH discount is a financial discount and not a trade discount. It is given by the seller to the buyer to get the money quickly so that he can use it to manufacture more goods. If any particular buyer was in the seller's place would he not demand observance of the cash discount clause? The buyer has no right to claim privileges from the seller when, if the situation was reversed, he would demand that to which he is entitled.

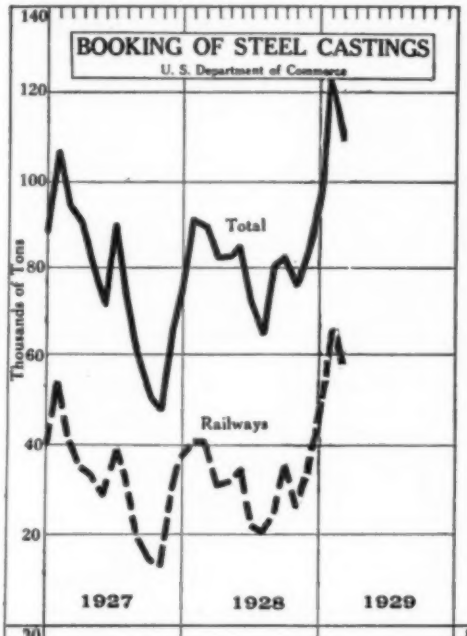
THERE is a real reason for and a real benefit to be derived from the proper exercise of cash discount terms. This discount is what the seller is willing to give his customers for the payment of his bill 20 days before the expiration of the full 30-day period. A 2 per cent discount thus gives the buyer an inducement of 36 per cent a year since there are 18 twenty-day periods which might be anticipated by the buyer if he was having shipments made to him constantly through the year. Where is it possible to make money faster? Foundrymen should follow the right practice with reference to cash discounts but also should insist that their cash discounts terms be observed by the customers which they serve.

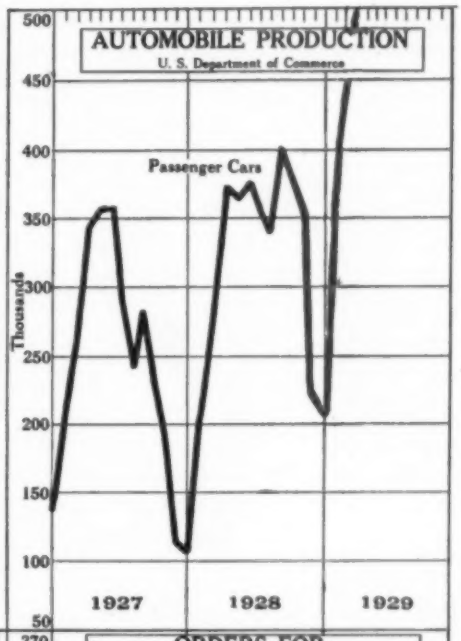
Trade Trends in Tabloid

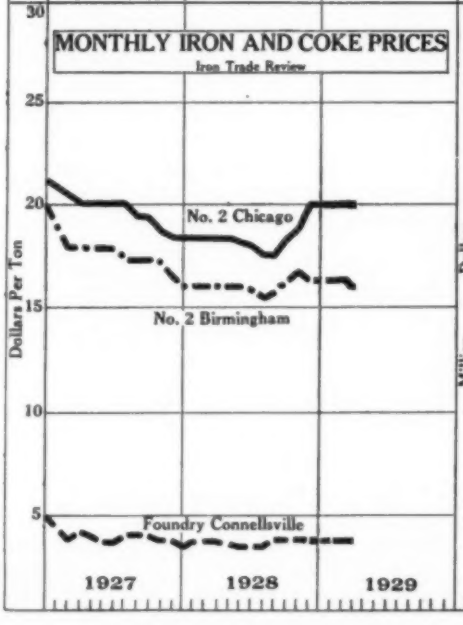
FOUNDRIES, almost without exception report business good. An unusual spirit pervaded the American Foundrymen's association convention, reflecting the satisfactory state of castings demand throughout the country. Consumption of nonferrous metals is the heaviest noted for several years. Copper, which skyrocketed to 24.00c has dropped back to 18.00c, leaving nonferrous price averages slightly above last year's average, but below the peak. Railroads so far this year have bought more cars than during the entire twelve months of 1928, with March showing more than 12,000 units ordered. Freight loadings are ahead of last year's high total. Automobile sales are holding up, with consequent high production schedules. Cast iron pipe demand is ahead of 1928. Jobbing foundries in the central west are augmenting their forces and buying iron in anticipation of higher melt. Stove and furnace interests report the best prospects for summer business in several years. Machine tool plants are busy and some operating foundries have farmed out castings during the past month. Gas engine builders, particularly those catering to the oil field demand are operating at top speed. Jobbing steel castings plants report orders in excess of present operating capacity. In the Philadelphia district gray-iron foundry operations are 15 per cent ahead of the 1928 production rate.

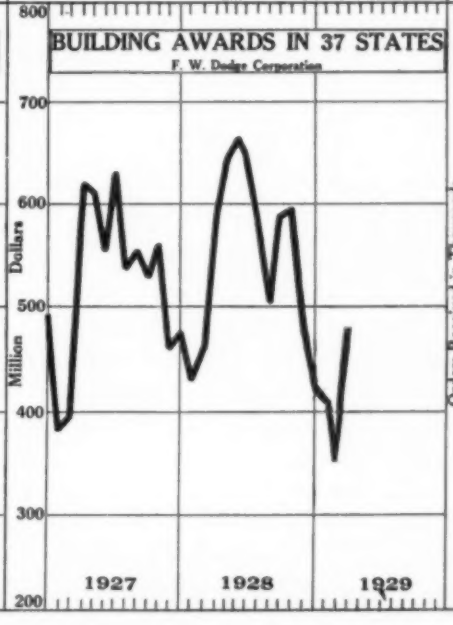
RAW MATERIAL PRICES
April 23, 1929

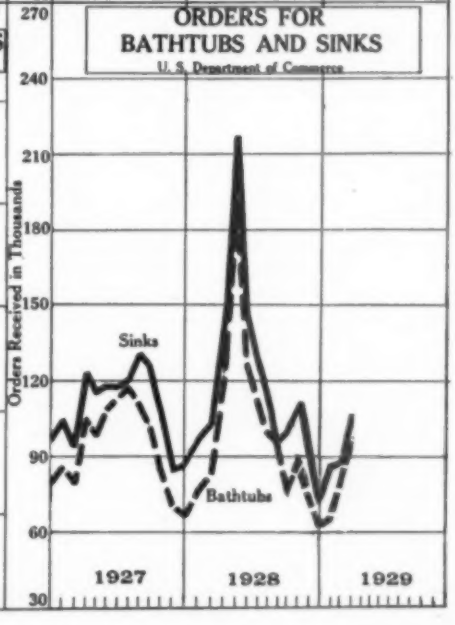
Iron	
No. 2 foundry, Valley	$18.00 to 18.50
No. 2 southern, Birmingham	15.00 to 15.50
No. 2 foundry, Chicago	20.00
No. 2 foundry, Philadelphia	21.76 to 22.26
No. 2 foundry, Buffalo	19.50
Basic, Valley	18.00 to 18.50
Basic, Buffalo	17.50
Malleable, Chicago	20.00
Malleable, Buffalo	20.00
Coke	
Connellsville foundry coke	$3.75 to 4.85
Wise county foundry coke	4.25 to 5.00
Scrap	
Heavy melting steel, Valley	$18.00 to 18.25
Heavy melting steel, Pitts.	18.00 to 19.00
Heavy melting steel, Chicago	16.00 to 16.50
Stove plate, Buffalo	13.50 to 13.75
Stove plate, Chicago	12.75 to 13.75
No. 1 cast, New York	17.00 to 17.50
No. 1 cast, Chicago	16.00 to 16.50
No. 1 cast, Philadelphia	16.00 to 17.00
No. 1 cast, Pittsburgh	15.50 to 16.00
No. 1 cast, Birmingham	14.00 to 14.50
Car wheels, iron, Pittsburgh	16.25 to 16.75
Car wheels, iron, Chicago	15.50 to 16.00
Railroad malleable, Chicago	19.00 to 19.50
Agricultural mal., Chicago	16.00 to 16.50
Malleable, Buffalo	19.00 to 19.50
Nonferrous Metals	**Cents per pound**
Casting, copper, refinery	17.62½
Electro, copper, producers	18.00
Straits tin	45.00
Lead, New York	7.00
Antimony, New York	9.50
Nickel, electro	35.00
Aluminum, No. 12, producers	23.00
Aluminum, No. 12, remelt	17.00 to 17.50
Zinc, East St. Louis, Ill.	6.50 to 6.60











Comings and Goings of Foundrymen

Men of the Industry, Whose Activities Are Making Foundry History

JAMES C. DAVIS, formerly fourth vice president in charge of operations of the American Steel Foundries, Chicago, has been elected advisory vice president in charge of operations. Mr. Davis formerly was connected with the Sargent Co., Chicago, for 17 years. In 1896, he was appointed general superintendent in charge of operations for that company and in 1901 accepted a position as general superintendent of Leighton & Howard Steel Co., St. Louis. When the two companies were absorbed in 1902 by the American Steel Foundries, he was appointed western district manager. In June 1905 he was made assistant to the first vice president in charge of operations at Chicago. In 1912, Mr. Davis was appointed fourth vice president in charge of foundry operations.

David C. Arthurs has been elected a director of the Mt. Vernon Car Mfg. Co., Mt. Vernon, Ill.

Robert Murrell, foreman of the Magnus Metal Co., Topeka, Kans., for the past four years, has been promoted to superintendent.

S. D. Den Uyl recently was elected secretary of the Bohn Aluminum & Brass Corp., Detroit, to succeed A. P. Lauer, who remains as director of the company.

Ernst C. Heyde has resigned his position with the Standard Sanitary Mfg. Co., Richmond, Calif., and has been made foundry superintendent of Skalla & Co., Buenos Aires, Argentine Republic, South America.

William H. Woodin, president of the American Car & Foundry Co. and director of the Federal Reserve bank of New York, received the honorary degree of doctor of laws from Juniata college, Huntington, Pa., April 17.

E. J. Hergenroether, formerly assistant metallurgist, Cadillac Motor Car Co., Detroit, now is associated with the development and research department, International Nickel Co., at the Detroit office, 4-117 General Motors building.

W. L. Chatfield, recently appointed foundry superintendent, Layne & Bowler Inc., Memphis, Tenn., formerly was connected with the National Transit Co., Oil City, Pa.; Kanawha Mfg. Co., Charleston, W. Va.; L. J. Mueller Furnace Co., Milwaukee, and again with the Kanawha Mfg. Co.

C. Vernon Nass has been made superintendent of the brass foundry of Fairbanks Morse & Co., Beloit, Wis. Mr. Nass previously was chemist and metallurgist for the Ohio Brass Co., Mansfield, O., from 1923 to 1928 and for the Humphreys Mfg. Co. of the same city until he accepted his present position.

Dr. Seigfried G. Werner, Dusseldorf, Germany, president of the Foundrymen's International committee which is in charge of the third International Foundrymen's congress to be held in London in June, and president of the German Iron Founders association, arrived in New York, April 1. He attended the American Foundrymen's association convention in Chicago where he addressed the banquet of the exhibitors.

JAMES C. DAVIS

August A. Busch, formerly president of the Busch-Sulzer Bros. Diesel Engine Co., St. Louis, has been elected chairman of the board of directors. He is succeeded as president by Edward B. Pollister, formerly second vice president, of the company. Mr. Pollister will continue to act as general manager. C. Drummond Jones, formerly fourth vice president, secretary and treasurer, succeeds Mr. Pollister as second vice president and will continue in his capacity as secretary and treasurer.

Melvin W. Ellis, president of the Hart Parr Co., Charles City, Ia., has been elected president of the Oliver Farm Equipment Co., which recently was formed by a consolidation of the Hart Parr Co., Charles City, Ia., Oliver Chill Plow Works, South Bend, Ind., and the Nichols & Shepard Co., Battle Creek, Mich. J. D. Oliver, president of the Oliver company, is chairman of the board of directors of the new company and Lewis J. Brown, president of the Nichols & Shepard Co., is executive vice president.

Granville P. Rogers, for the past three years, secretary of the Artistic Lighting Equipment association, New York, recently has been appointed director of the Steel Founders' Society of America, Pittsburgh. Mr. Rogers for many years was general sales and advertising manager of the Pyrene Mfg. Co., Newark, N. J., and later was sales manager of the general automotive equipment department, of Johns-Manville Inc., New York. In addition he was in charge of merchandising and advertising for several large corporations covering widely diversified lines of business.

Return From Europe

Robert D. Black, advertising manager, and W. A. Rowe, production manager, Black & Decker Mfg. Co., Towson, Md., have returned from Europe where they spent several months at the factory of Black & Decker Ltd., Slough, Bucks, Eng., and visiting many of the European markets. They also attended the Leipsig fair at Leipsig, Ger.

Joins Sales Force

Edward Carroll, son of J. J. Carroll, C. & G. Foundry Co., Sandusky, O., has joined the force of the Great Lakes Foundry Sand Co., Penobscot building, Detroit. Mr. Carroll has just finished a special course at Notre Dame and Rutgers universities. He will represent the Great Lakes company in the Ohio territory.

Melts Iron in a Cupola

(*Concluded from Page* 400)

creates a pressure difference proportional to the volume of air flow in accordance with the relation:

$$V = K \times F \sqrt{\frac{h}{Y}}$$

Where V = Volume of cubic feet per hour
K = a coefficient
F = area of orifice in square inches
Y = specific gravity

Typical examples of many types and arrangements of orifice plates are indicated in Fig. 114, 116, and 117. Plates generally are made of monel metal, and may be inserted readily between flange joints of the pipe line. The distances K_1 and K_2, Fig. 117, must be determined for any given installation. This information is supplied by the instrument makers. Differential pressure as with other devices is measured by various types of manometer tubes or recording instruments as illustrated in Fig. 123.

FRANK F. SEAMAN

The Wilson-Crosby blast meter shown in Fig. 123 operates on a different principle to those already described. A balanced disk in the pipe line is mounted on a rocking lever. The movement of this disk, proportional to the velocity of air flow, is transmitted by a cord to the recording instrument. This recording instrument combines a direct reading and recording instrument with a direct reading static pressure dial. The dials are graduated by calibration under standard conditions of air flow. Among the merits of this instrument are simplicity in operation and maintenance coupled with stout construction; highly desirable features in instruments employed around a cupola plant. Typical diagrams from one of these instruments are illustrated in Fig. 109.

Receive Appointments

Frank F. Seaman, formerly associated with the Chisholm-Moore Mfg. Co., Cleveland, has been appointed general manager of the new crane and hoist division of Robbins & Meyers Inc., manufacturers of electric motors, motor-generator sets and electric fans. Mr. Seaman has been engaged since 1902 in the design, manufacture and sale of hoisting machinery with the Sprague Electric works of the General Electric Co., Schenectady, N. Y., Yale & Towne Mfg. Co., Stamford, Conn., Toledo Bridge & Crane Co., Toledo, O., Euclid Crane & Hoist Co., Euclid, O., and the Chisholm-Moore Mfg. Co., Cleveland. Carl E. Schirmer, formerly connected with the Union Pacific railroad, Schaffer Engineering & Equipment Co., Tiffin, O., Toledo Crane Co., Bucyrus, O., and more recently chief engineer of the Chisholm-Moore Mfg. Co., Cleveland, has been appointed chief engineer. The sales department will be in charge of John R. Mears with Albert Kreh, William J. Scott and John J. Becker as district sales managers for New York, Chicago and Detroit respectively. The new crane division of Robbins & Meyers, Inc., will handle hoists, cranes and trolleys in various sizes and styles, up to 10 ton capacity.

Detroit Foundrymen Meet

At its meeting on April 18 the Detroit Foundrymen's association elected Russell M. Scott, foundry manager, Packard Motor Co., as president. Other officers elected were as follows: Vice president, James L. Mahon, American Car & Foundry Co.; secretary, William J. Muhlitner, Great Lakes Foundry Sand Co.; treasurer, Fred A. Cowon, W. R. Thompson Co. The members of the executive board are as follows: Peter W. Mulder, Almont Mfg. Co.; George L. Grimes, Grimes Molding Machine Co.; Fred J. Walls, Wilson Foundry & Machine Co.; Harry Rayner, Dodge Bros; J. J. Boland, Griffin Wheel Co.

The annual banquet of the Detroit Foundrymen's association will be held Tuesday, May 7, at the Fort Shelby hotel. Robert Crawford, Atlas Foundry Co., will act as toastmaster. Judge Arthur Kilpatrick, who in his youth was a foundryman, will talk on his experiences in the foundry.

Makes Personnel Changes

Several changes in the personnel of the American Steel Foundries were made recently. James C. Davis, formerly fourth vice president in charge of foundry operations, has been elected advisory vice president in charge of operations and A. W. Walcher, formerly assistant to the fourth vice president, has been appointed vice president in charge of operations. F. A. Lorenz, Jr., formerly assistant to the fourth vice president in charge of operations and works manager of the Indiana Harbor, Ind., plant of the company, has been appointed assistant vice president in charge of operations. James Suttie, formerly assistant works manager of the Indiana Harbor, Ind., plant of the company, has been named works manager and Warden Wilson, formerly night superintendent, has been appointed assistant to the works manager. F. F. Dore, formerly assistant general chief chemist of the company, has been made general chief chemist. A number of promotions also have occurred in the sales department where Fritz B. Ernst, formerly assistant first vice president, has been named vice president, sales department as also was Gabriel F. Slaughter, formerly sales agent for the company. H. D. Hammond, formerly general manager of miscellaneous sales, has been appointed vice president in charge of miscellaneous sales.

JOHN R. MEARS

Armstrong Cork & Insulation Co., has moved its offices from Pittsburgh to Lancaster, Pa.

What the Foundries Are Doing

Reflecting the Activities of the Gray Iron, Malleable, Steel and Brass Shops

Montpelier Foundry & Machine Co., Montpelier, Ind., has been placed in the hands of receivers.

Dominion Stove & Foundry Co., Penetanguishene, Ont., is having plans prepared for a $25,000 addition.

Estate Stove Co., Hamilton, O., plans the construction of a foundry addition and pattern shop to its East avenue plant.

William F. Hartig Plow Co., Evansville, Ind., plans to build a plant addition which will increase production 50 per cent.

Cedar Foundry & Mfg. Co., Cleveland, has leased a building at 2167 East Fifty-fifth street for a plant.

John Staples, Mt. Vernon, Ind., plans the construction of an addition, 2 stories, 35 x 80 feet, to his foundry.

Coshocton Iron Works, Coshocton, O., is planning to start construction immediately on a foundry, according to J. S. Skelly, president.

Sully Brass Foundry Ltd., Toronto, Ont., has removed from 2388 Dundas street, West, to 7-15 Wabash avenue.

J. T. Rich has established a brass, bronze and aluminum foundry at 310 Tenth street, Knoxville, Tenn.

Van Loon Pattern Works, Anderson, Ind., rapidly is completing its new plant building. (Noted March 1.)

Fulton-Harwood Brass & Aluminum Co., South Bend, Ind., reports business good and a recent increase in employes.

Mathieu & Sons Foundry Co., Bridgman, Mich., plans to construct a 1-story plant addition, 60 x 240 feet, with equipment.

International Steel Co., Canton, O., recently incorporated, will reopen the former plant of the Canton Steel Foundry Co., Canton.

The plant of the National Steel Castings Co., Montpelier, Ind., has been petitioned to be sold to Max Zeigler, Muncie junk dealer, for $15,000.

National Foundry Co., Dayton, O., has awarded a general contract to A. W. Kimmel Co., Dayton, for a one-story addition. It, together with the equipment, will cost about $22,000.

Buffalo Foundry & Machine Co., Buffalo, recently has completed its new office building. A storage building, 60 x 225 feet, with a 35-40 ton crane also has been completed.

Acme Aluminum Foundry Co., 814 West Seventy-Fifth street, Chicago, is considering a 2-story and basement addition, 50 x 125 feet. The building and equipment will cost about $45,000.

Columbia Malleable Castings Co., Columbia, Pa., has resumed operations, which were suspended recently due to damage suffered to the plant during a heavy wind storm.

Evansville Malleable Castings Co., 2549 East Colm street, Evansville, Ind., plans an early call for bids for a one-story foundry addition. The building and equipment will cost nearly $35,000.

Electro-Alloys Co., Elyria, O., has installed an electric furnace, made by the Pittsburgh Electric Furnace Co., Pittsburgh. The furnace will be used for research and production of special castings.

Holmes Foundry Co., Ltd., Port Huron, Mich., will open its foundry at Sarnia, Ont., soon. The plant has been closed for about 18 months during which time considerable new equipment has been installed.

Myers Machine & Tool Co., Detroit, manufacturer of tools and dies, will locate at Lima, O., and take over the former plant of the Lima Castings Co. Three buildings will be remodeled at a cost of $40,000. Louis Myers, Detroit, is president.

Porterville Foundry, Porterville, Calif., is building an addition to its plant. The company manufactures various types of pumps and does jobbing work in iron, brass and aluminum. C. C. Rumble is the proprietor.

Markey Bronze Bushing Co., Delta, O., is completing an addition giving it 2590 square feet additional floor space, largely for offices, tool room, etc. This will release present floor space for additional foundry and machine equipment.

Pacific Gas Radiator Co., 7541 Roseberry street, Huntington Park, Calif., recently has increased its melting capacity by the installation of a cupola, a blower, a steel charging platform and an electric elevator.

Conveyor Co., Los Angeles, has purchased a 6-acre site on East Slauson avenue, Los Angeles, and will erect buildings for its various operations. It is probable that a foundry will be included in the expansion program.

W. A. Jones Foundry & Machine Co., 4401 West Roosevelt road, Chicago, will build a one-story foundry addition, 100 x 130 feet, which will cost approximately $15,000. Weis & Neisteadt, 53 West Jackson boulevard, Chicago are the architects.

Rundle Mfg. Co., Twenty-seventh and Cleveland avenues, Milwaukee, has awarded the general contract for the construction of a group of buildings at Camden, N. J., including foundry, etc., to Barclay, White & Co., 22 North Thirty-sixth street, Philadelphia.

Twin City Foundry Co., Aberdeen, Wash., recently incorporated with $20,000 capital plans construction of a frame foundry plant at 420 South G. street. Incorporators are Walter Christian, Warren Scott, William Fireminger and G. H. Allison.

Texas Electric Steel Castings Co., Houston, Tex., F. A. Kroll general manager, has completed new main plant building, 128 x 240 feet, and is building a pattern storage shop, 40 x 80 feet, and warehouse, 40 x 80 feet. Plans have been made for a separate laboratory building.

Nash Motors Co., Kenosha, Wis., is erecting a $150,000 addition, 100 x 250 feet, to its foundry at its branch works at Racine, Wis., and is inquiring for two cranes and other equipment. D. M. Averill is general manager of the Racine division.

Caterpillar Tractor Co., Peoria, Ill., soon will begin work on additions consisting of a main assembling and production unit, 475 x 1200 feet, with a gray iron foundry adjoining. The buildings and equipment will cost in excess of $1,500,000. (Noted March 1.)

Robert Haley, for some years a partner in the Master Carburetor Co., Los Angeles, has leased the foundry formerly operated by the Earle Hardware Mfg. Co., at 2369 East Fifty-first street, Los Angeles, where he will operate the Haley Brass Foundry.

American Steel Foundries soon will begin the manufacture of steel car wheels at its Alliance, O., plant. The project involves the purchase of additional equipment and a new department at the plant. H. E. Wheeler, formerly works engineer, has been appointed head of the new department.

Recent reports that a new company will be formed to take over the business of the Minneapolis Steel & Machinery Co., Minneapolis, the Moline Implement Co., Moline, Ill., and the Minneapolis Threshing Machine Co., Minneapolis, have been confirmed by W. C. MacFarlane, president of the Minneapolis Steel & Machinery Co.

Atlas Iron Works Co. Inc., recently has been organized with the following officers: E. V. Grover, president; J. G. Moroney, vice president and D. L. Swinnerton, secretary. Officers of the company formerly were connected with the Baker Iron Works prior to its recent consolidation. The company has erected a general jobbing foundry, 60 x 180 feet, at Eastern avenue and Sixty-first street, Los Angeles. Operations will be started soon.

General Steel Castings Corp., Philadelphia and the Commonwealth Steel Co., Granite City, Ill., have negotiations under way for the consolidation of the two companies. The Commonwealth company makes locomotive beds, car trucks, and car and locomotive parts. J. P. Morgan & Co., New York, is handling the financing of the proposed merger.

The Midland Engineering Co., recently formed by the bondholders of the McMyler-Interstate Co., Bedford, O., is preparing to resume operations on a much larger scale than the plant has been working for a long time. The production of tractor cranes and other road building equipment will be continued, together with a lighter line.

A redistribution of work now is under way at several of the plants of the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Patterns for castings to be used at the East Pittsburgh plant of the company are being moved from Cleveland to Trafford City, Pa., where the castings will be made in the future. The Cleveland foundry will be operated on various types of work for other plants. Other types of manufacturing operations will be added to the Cleveland plant in the future.

New Trade Publications

MANGANESE STEEL—American Manganese Steel Co., Chicago, devotes the current issue of its house organ to description of some pieces of equipment of its manufacture which have given long service, due to excellence of the alloy steel used in its manufacture.

TRAMRAIL—Cleveland Electric Tramrail division of the Cleveland Crane & Engineering Co., Wickliffe, O., describes in a bulletin recently published the factors of speed and endurance possible in transporting materials in industrial plants by use of its devices.

GRAY IRON—A resume of processes in the manufacture of gray iron developed since 1920 has been issued by the Whiting Corp., and is the second of a series of papers by Dr. Edward E. Marbaker of the Mellon institute and previously published in THE FOUNDRY. These papers are issued at intervals of about a month in the interest of the foundry industry.

INDUSTRIAL BUILDING—A. A. Wickland & Co. Inc., Chicago, engineer, has issued a looseleaf bulletin to describe a method of planning industrial plants by analysis of requirements and application of engineering ideas to obtain the best results from the money expended. Illustrations include views of plants, interiors and diagrams of plant layouts.